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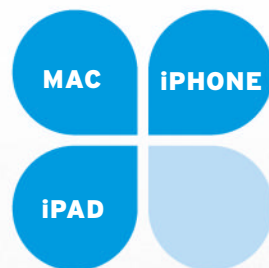


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# Mac | Life

SEPTEMBER 2015 NO.106



WWW.MACLIFE.COM

## INSIDE

iPHONE 6S  
4K iMAC  
& MORE!

# APPLE'S NEXT BIG THING

From **Apple Car** to **iPad Pro**:  
read our comprehensive insider  
report on the next-generation  
products in Apple's labs **p22**

Future

## HOW TO:

Create stunning albums in Photos  
Back up iPhone photos for free  
Track your gas with Numbers  
Take better notes on iOS





In a sea of cookie cutter bags and cases, the North Carolinian leathersmiths ColsenKeane handcraft is the kind of head-turning bag you'll consider an heirloom. The No. 4313 Satchel: hand-stitched beefy aged hide, eight hours of artisanship, copper rivets and four heavy-duty buckles comprise the last bag you'll ever own. Guaranteed for life. The acme of grassroots American made custom leather goods for the vintage-minded in the digital age.



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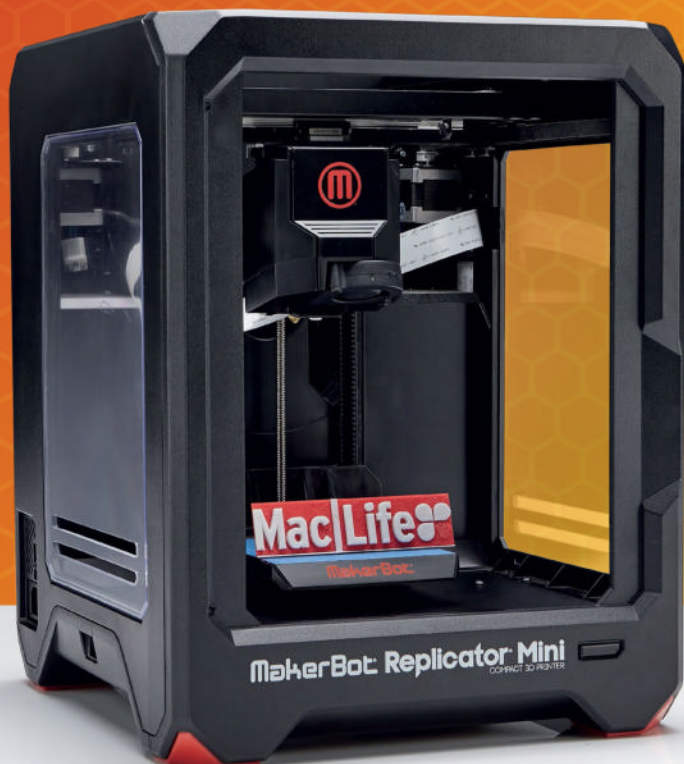
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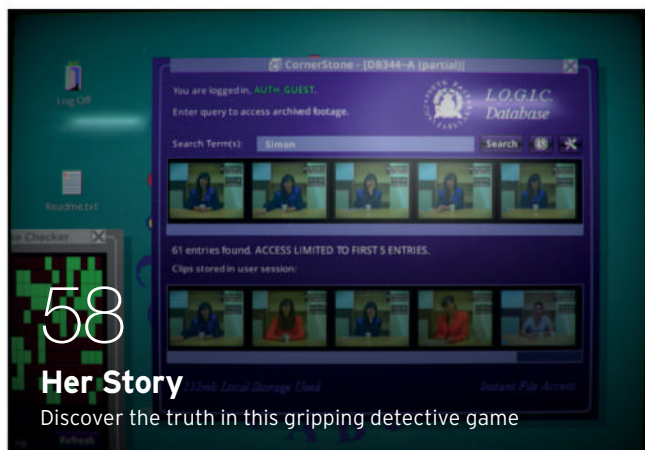
### Get into 3D printing

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Garmin VIRB Elite







## Introducing Blackmagic URSA Mini, the lightweight Super 35 4.6K digital film camera with 15 stops of dynamic range!

Introducing URSA Mini, a handheld Super 35 digital film camera with an incredible 4.6K image sensor, global shutter and a massive 15 stops of dynamic range! The super compact and lightweight design is perfectly balanced, making it comfortable enough for all day shooting. URSA Mini lets you shoot at up to 60fps, features a 5" foldout viewfinder, dual RAW and ProRes recorders, and more!

### Incredible 4.6K Sensor

URSA Mini can capture images at a resolution and dynamic range that goes well beyond that of traditional motion picture film so you can shoot your own epic, cinematic masterpiece! You can capture images up to 4608 x 2592, which is larger than 4K DCI, with 15 stops of dynamic range so you get incredibly clean pictures with amazing detail in everything from the darkest shadows to the brightest highlights! URSA Mini can record 4.6K at up to 60fps, or 1080 HD at up to 120fps.

### Lightweight and Portable

URSA Mini's perfectly balanced body is made out of space aged magnesium alloys so it's rugged, yet lightweight and comfortable enough to be used all day. You get a super bright 5" fold out touch screen for on-set monitoring, that can also display overlays for timecode, histograms, audio meters, focus peaking and more! URSA Mini features full size, professional connectors, even 12G-SDI, so you don't need custom cables, plus high quality stereo microphones and a side grip mounted on a standard rosette.

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Blackmagic URSA Mini is completely customizable so you can create a rig that's built specifically for your production! Add accessories like the Blackmagic URSA Viewfinder and Blackmagic URSA Mini Shoulder Kit, or choose from hundreds of third party accessories. URSA Mini has 9 standard 1/4" threaded mounting points on the top and bottom of the camera so you can mount it directly to a tripod as well as add accessories such as rails, matte boxes and more.

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hot (and what's not) on iTunes and whether you agree with our pick of the best new iOS games. We'll also alert you to the best Apple deals plus keep you informed and entertained until the next issue.

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## EDITORIAL

EDITOR-IN-CHIEF **Chris Slate**  
MANAGING EDITOR **Chris Hoffman**  
EDITOR **Matt Bolton**  
OPERATIONS EDITORS **Jo Membery, Ed Ricketts**  
CONTRIBUTORS **John Archer, Desiree Athow, Adam Banks, Orestis Bastounis, David Biedny, Alex Blake, JR Bookwalter, David Chartier, Emma Davies, Ian Evenden, Cameron Faulkner, Craig Grannell, Rosie Hattersley, Kenny Hemphill, Alastair Jennings, Cliff Joseph, Joseph Leray, Angela Nicholson, Nick Peers, Christopher Phin, Dave Stevenson, Jordan Erica Webber, Brianna Wu**

## ART

ART DIRECTOR **Paul Blachford**  
ART EDITOR **Mat Gartside**  
CONTRIBUTORS **Apple, Thinkstock, Neil Godwin**

## BUSINESS

DIRECTOR OF SALES **Stacy Gaines**, [sgaines@futureus.com](mailto:sgaines@futureus.com)  
VICE PRESIDENT STRATEGIC PARTNERSHIPS **Isaac Ugay**, [isaac.ugay@futurenet.com](mailto:isaac.ugay@futurenet.com)  
REGIONAL SALES MANAGER **Michael Plump**, [mplump@futureus.com](mailto:mplump@futureus.com)  
REGIONAL SALES MANAGER **Tad Perez**, [tperez@futureus.com](mailto:tperez@futureus.com)  
REGIONAL SALES MANAGER **Austin Park**, [apark@futureus.com](mailto:apark@futureus.com)  
REGIONAL SALES MANAGER **Jessica Reinert**, [jreinert@futureus.com](mailto:jreinert@futureus.com)

## MANAGEMENT

CONTENT & MARKETING DIRECTOR **Nial Ferguson**  
HEAD OF CONTENT & MARKETING, TECHNOLOGY **Nick Merritt**  
GROUP EDITOR-IN-CHIEF **Paul Newman**  
GROUP ART DIRECTOR **Steve Gotobed**

## PRODUCTION

PRODUCTION MANAGER **Mark Constance**  
PRODUCTION CONTROLLER **Frances Twyman**  
PROJECT MANAGER **Clare Scott**  
PRODUCTION ASSISTANT **Emily Wood**

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**Chief executive** Zillah Byng-Maddick  
**Non-executive chairman** Peter Allen  
**Interim chief financial officer** Penny Larkin-Brand  
Tel +44 (0)207 042 4000 (London)  
Tel +44 (0)1225 442 244 (Bath)

## FUTURE US, INC.

4000 Shoreline Court, Suite 400, South San Francisco, CA 94080

Tel: 650-872-1642 [www.futureus.com](http://www.futureus.com)

SENIOR VICE PRESIDENT **Charlie Speight**  
VICE PRESIDENT, MARKETING & OPERATIONS **Rhoda Bueno**  
DIRECTOR, HUMAN RESOURCES **Eric Buska**

## FUTURE PLC

Quay House, The Ambury, Bath, Avon, BA1 1UA, United Kingdom  
Tel: +44 (0)1225 442244 (Bath) • Tel: +44 (0)2070 424000 (London)

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**BACK ISSUES:** [www.maclife.com/shop](http://www.maclife.com/shop) or 1-800-865-7240.

**REPRINTS:** Future US, Inc., 4000 Shoreline Court, Suite 400, South San Francisco, CA 94080.

Phone: (650) 872-1642. Fax: (650) 872-2207. Website: [www.futureus.com](http://www.futureus.com).

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## THE REAL REVOLUTION



**WHEN 2015 COMES** to a close, it will have seen the launch of Apple Watch, iOS 9, OS X El Capitan, the next iPhones and iPads, and maybe even a new Apple TV. But, so far, what stands out to me most is Apple Music. I'd only toyed with similar services before, but now I realize my relationship with music is changing. Thanks to Apple Music's free three-month trial, I'm sure millions of people are coming to the same conclusion, that streaming music isn't just a fringe option; it's taking over the medium. The true form of digital music, and the evolutionary end to the line of CDs, cassettes, vinyl records, and so on. Of course, people will continue to buy individual songs and albums; that option isn't

going away. But when iTunes, the world's biggest music store, throws open its doors and says, "Give us 10 bucks, and go wild," there's no going back.

It puts practically any song or album at your fingertips. I'm still a little hung up on the concept of ownership, to the degree that word still exists... What happens if I quit subscribing, or if the service is cancelled? None of the songs I streamed would be available to me anymore. That concern lessens every day, though, as I become accustomed to the overwhelming value and variety. Music has always been more disposable to me than other media. So for me, Apple Music will likely end up besting Apple Watch as the company's real game-changer this year.

Speaking of the Watch, it's widely believed that the device is suffering a significant post-launch slump. Apple hasn't released official figures, but the Watch is estimated to have sold over three million units during its first three months in the US. From one perspective, selling that much of anything in such a short time is impressive. But those people who demand iPhone- or iPad-level sales must be disappointed. I'm sticking with my pre-launch prediction that the Watch will maintain a small but steady level of success.

No matter what the future holds for Apple Watch, I think Apple Music will be more important in the long run. At first the service may not have seemed like a true game changer since it doesn't do anything especially new, but by building it into the default music app on every iPhone, iPad, iPod, and Mac – and then offering a free trial to hundreds of millions of users – Apple may have just turned streaming music into the new status quo.

**CHRIS SLATE**, Editor-in-Chief  
Twitter: @ChrisSlate

## >>> THE TEAM



**Matt Bolton**  
**Editor**

Matt wants to give us all 3D printed dolls of himself. Er, yeah, thanks Matt...



**Mat Gartside**  
**Art Editor**

Mat's going to print some new golf balls. Because he keeps losing his.



**Jo Membro**  
**Operations Editor**

Jo's delighted by 3D sugar craft. Hours to print, seconds to devour.





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## LETTER OF THE MONTH



I just read your article about the future of OS X and iOS (#103). I'm surprised that nobody ever suggests an alternative to pressing the Home button, especially all the double-tapping needed to close apps from the Fast App Switcher. All that pressing will cause the Home button to break. The iPhone needs more gestures; for example, swiping three fingers up could take you to the Fast App Switcher without needing to press the button.

**ANDREA**

I don't think you need to worry about breaking the Home button as long as you aren't unusually hard on it, but some readers might be interested to know that pinching in with four fingers does bring up the Home screen... on an iPad. The tablet gets special gestures that work better with its larger screen. On an iPhone you might consider trying AssistiveTouch (Settings > General > Accessibility > AssistiveTouch). This puts a dot on the side of the screen; touch this to bring up a menu of shortcuts, one of which will take you to the Home screen. It doesn't include a shortcut to the Fast App Switcher, though.

### New direction

Thanks for the "80 Amazing Apple Watch Tips" article in your July issue. I just took a trip to the UK and was thankful I had an Apple Watch. My favorite app is AroundMe; it helped me find a pub in unfamiliar territory. The step-by-step walking directions are great! The only downside to the Watch is that I don't know as much about it as I'd like, though the learning curve is pleasant, not bumpy. Thanks to the Brain Trust at Apple for this wonderful new technology.

**KAY KORBEL**



Where am I?  
Ask your Watch.

Glad to hear you're getting good use out of your Watch, Kay! I've enjoyed using mine for walking and driving. While Apple Maps runs like normal on an iPhone, the Watch taps my wrist when I approach a turn. Thanks to those

taps and Siri's audible directions, I hardly have to look at the map on the screen anymore.

### Asking for trouble

I really want a new iPad Air 2 or iPad mini 3, but I know my wife will say no, so... do you think I could get away with pretending I won a competition in your magazine? It would be so funny if you started a "Fake My Win" service. **RICH**

**The last thing we need is for your wife to come to our office and start knocking heads. Find some cool new apps she'd be into and bring her on board. Just be prepared to share your new toys.**

### Small dreams

I and many of my friends would much prefer a new iPhone in the original smaller size. Bring back



Bigger is not always better, but going back to a smaller iPhone is unlikely.

the 4S mold with all the modern upgrades! A bigger screen is not better for many of us. **JEAN J.**

**After the iPhone 6 and 6 Plus received such a positive response and record-breaking sales, I think going back to the 4S is unlikely. But the recent iPod touch upgrade might be a good sign for the 5C.**

### Apple Music critic

It looks like Apple has made another big mistake with iTunes. Who in their right mind would want to pay Apple \$10 a month (\$120 a year) to stream music? I hardly buy any music these days, not from iTunes, on CDs, or otherwise. I like all the older music that I own, and care very little for much of the noise being produced nowadays. My favorite American band is ELO, so that'll tell you how old I am. **ERWIN SIEGEL**

**It doesn't sound like you're Apple's target audience, Erwin. But, hey, you don't need to subscribe to Apple Music - just loop *Evil Woman* and *Twilight* to your heart's content! For people who regularly buy at least one album a month, spending that cash on unlimited access to every song in iTunes is a pretty good deal.**

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To get the most out of Apple Music, go to [bit.ly/techradar\\_apple\\_music](http://bit.ly/techradar_apple_music)

There's so much to like with Apple's services. But so many teething issues too...



## Will Apple ever get online services right?

Apple Music shows that, once again, its online skills need sharpening

BY MATT BOLTON

**APPLE AND ONLINE** services has always been a difficult pairing, producing fiascos such as the Maps launch or, most infamously, MobileMe. The latter was easily Apple's lowest point when it came to the cloud – an online service that was paid for, but simply couldn't do the what it was intended for. When it was replaced by iCloud, and Steve Jobs announced all the wonderful new things iCloud would do on stage, even he acknowledged that people had a right to be skeptical of these promises, asking rhetorically "Why should I believe them? They're the ones that brought me MobileMe!"

Now, with Apple Music in the hands of millions of people, we're seeing some of Apple's old issues rearing their heads. At its launch, many people had trouble activating iCloud Music Library, seemingly due to strain on the server – it could be resolved the next day, but meant a major part of the service wasn't working for people when they gathered their

# The smart car hacking problem

As cars get more automated and connected, we need to protect them **BY MATT BOLTON**

first impressions of it. A few weeks later, it experienced some down time, along with several other Apple cloud services, that meant anyone who had come to rely on it simply couldn't listen to their music. Down time is always a risk when using online services, but it's an area Apple has especially struggled with – Siri suffered from significant periods of down time when it launched, too.

**STILL, DOWN TIME** ends, and can be ironed out in the future. But Apple Music has also revealed some functional issues over time. While not quite Maps levels of problems, they are significant. Well-known Apple commentator Jim Dalrymple has given up on Apple Music completely after first some irritating but relatively minor issues with songs on “greatest hits” albums not appearing if the songs were elsewhere in his library already – on a totally different album, for example – but then having it erase around 4,700 songs from his library when he deactivated it, many from long-gone CDs. Meanwhile, here at *MacLife* we've been finding the Music app becoming increasingly likely to crash when it's opened, seeming partly to do with it struggling to connect to the Apple Music server.

Apple is hardly the only company with online services that struggle from time to time, if it wants to replace what we're using from other companies, it needs to focus more on getting things right before launch, not after.

**MODERN CARS ARE** packed with technology, from parking and braking assists to wireless connectivity – and are evolving further all the time. (See p22 for more on future car technology.) This makes them smarter and more useful than ever, but also vulnerable to hacking in a way they haven't been before. This reached a head recently when noted security researcher Charlie Miller showed *Wired* an exploit in Jeep Cherokee vehicles that allowed his team to control many of its systems – starting with its climate control systems before cranking up the radio and showing images of the hackers on its dash-mounted screen. More of a nuisance than a worry... until the hackers cut a Jeep's transmission as it cruised along the highway.

The hack took advantage of the Jeep's built-in Sprint connectivity and severe lack of security to take a remarkable level of control of its systems, but there is at least a patch for this specific exploit.

The concern is that the car industry simply isn't diligent or experienced enough about the digital technology it's increasingly making use of. And as cars move increasingly towards full autonomy, it's a problem that only becomes more crucial. A new automotive security bill is being introduced in the Senate as a result of the report, which will hopefully kick companies into action quickly, provided that it's effective and comprehensive enough. In the UK,

recently announced rules for testing driverless cars already include provisions that there must be an appropriate level of security.

We don't think this should put you off the idea of more automated vehicles, but it's absolutely a wake-up call that companies need to be very careful when building in new technologies. There's an interesting parallel with the Internet of Things and home automation here, with many companies building things like home security cameras, but failing to make their feeds secure to outside intrusion. That's one of the problems Apple's HomeKit aims to fix there – but it won't be so easy to ensure that the many different car companies will achieve this too.

Tech advances cause security concerns.





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**MOONRISE \$10.99**

It's Pokémon! On Mac! Not exactly, but that's the basic hook here: you'll go out with a team of little creatures, and battle and recruit more creatures as you progress through the world. It's less cutesy than Nintendo's game, and the interface is a little fiddly for its real-time combat, but this feels polished and fun already.

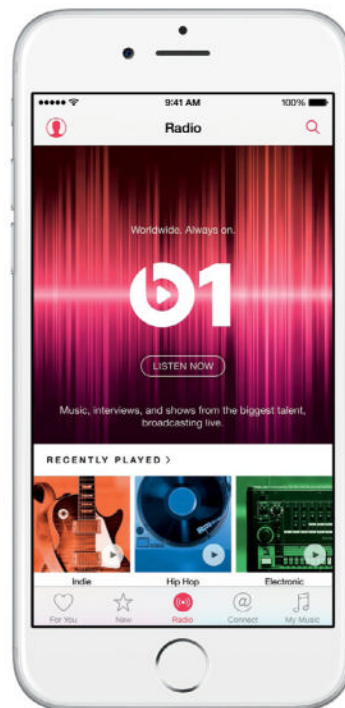
**VERSION TESTED: 1.625.0**



**THE CURIOUS EXPEDITION \$14.99**

This is an intriguing game of going off to randomly generated landscapes to explore, finding fascinating things, and returning to see if other explorers did as well as you. You get little story moments and tough decisions on the way. Right now, it's really lacking in explanation, but there's lots of depth on offer.

**VERSION TESTED: ALPHA 12.1**



# Apple Music: the good, the bad, the confusing

Ignoring technical issues, is it a good service?

BY MATT BOLTON

**APPLE'S MUSIC** streaming service finally arrived at the end of June, alongside Beats1, a traditional-style radio station. For \$9.99 per month, you get access to tens of thousands of tracks, all built right into iTunes or the iOS Music app. It's convenient, and it's clever and exciting, but we've also had some reservations about it.

The music selection is great, with some unique treats, including Radiohead's *In Rainbows* and (following a big public discussion) Taylor Swift's *1989*. That said, at the time of writing,

we've noticed some albums available on other services are missing - especially movie soundtracks.

Apple Music also streams its tracks in lower quality than its biggest competitors - 256kbps versus 320kbps from Spotify or 1441kbps from Tidal. For most people, this won't make a difference, but if you've invested in really good speakers and headphones, you might find it a little flatter.

Apple Music's killer feature is on a different level though: it's the curation. Once it

understands what you like, you get a selection of music in the For You section, which you can easily keep available for future playing if you discover something new you love. That said, the setup process is pretty inflexible, making you choose your "favorite" bands from a limited selection. We also find the app too busy on iPhone yet too sparse on iPad, and so quite fiddly on both. It also lacks Spotify's awesome collaborative playlists. It's a good start, but we hope to see a lot of refinement over time.

## ➤THE SHIFT

With OS X now offering a more hand-in-hand approach with iOS devices, **DAVID CHARTIER** is impressed with the latest Mac app developments



**T**raditional PC sales, as a whole, have been in decline for a few years. Bucking that trend, though, is the good ol' Mac, which has experienced respectable growth over the past decade. As a result, more apps that started out on the web or mobile are now making their way to the Mac. One could say the Mac has remained a quiet bystander through the iOS explosion. But that's slowly changing.

### Apps that started out on the web or mobile are now making their way to the Mac

Take Quip, for example (Quip.com), an online productivity suite that offers collaborative document and spreadsheet editing, similar to Google Drive and Office Online (actually, it's my favorite service in this category, I highly recommend it). Quip started as a web app and has offered an iPhone and iPad app for some time. But very recently it made the leap to the Mac with a native app that supports drag-and-drop and Handoff, Apple's clever feature for moving your current document or task between devices so you don't skip a beat.

**LAST YEAR, MICROSOFT** released the first Mac version of OneNote, its note-taking and idea scrapbook app. Naturally, it's been a Windows app for a while, but it arrived on iPad a couple of years ago, and it then made the leap to the Mac with a fully featured, native version.

There are a number of other examples, including even Tumblr, my favorite blogging service, which started as a web app and has long offered iOS and Android apps. Even third parties are building Mac versions of mobile-only apps, such as a menu bar utility for controlling Nest, Google's smart thermostat.

There are various reasons for why all these developers and companies are coming back to the Mac. Some

argue the App Store's restrictions stifle too much innovation, while others tell me that consumers feel entitled to get everything on their phones for free. A couple have said the Mac was always in the cards, they just went mobile first because it's easier to build for iOS in some ways.

**I WOULDN'T GO** so far to say that the tide is turning or mobile is no longer a major part of our future. But now that the initial excitement has subsided a little, I think we're getting a better picture of what mobile can and cannot accomplish (at least for now). We're rediscovering that there is still a real need for good, genuine Mac apps because that's where so much of our work needs to get done.



Thanks to improved continuity between iOS and OS X, developers are hard at work on Mac apps.

»» David Chartier is a content strategist and writer with vast experience analyzing the tech world. He runs the website *Finer Things in Tech* (finerthings.in) and hosts its podcast, The Finer Things In.

# 6 companies Apple bought that made it what it is today

Without bringing in this outside talent, the Apple world would be a very different place

BY MATT BOLTON



iTunes 1 was but a mere music player – few knew that Apple would grow it into the center of a digital multimedia ecosystem.

**HOW DOES APPLE** create all those hardware and software features in-house? Does it just have tens of thousands of employees? Well, yes. But that's still not enough to do everything it might want to. Sometimes, Apple wants to go in a new direction fast, and that's where buying another company with expertise is the best option.

Apple has bought dozens of companies over the years, including bringing in software that would be the basis of apps such as GarageBand, Final Cut and AppleWorks. But as great as those are, they're just add-ons. These are the companies Apple bought whose technology was vital for creating the apps and services that make it as successful as it is – and for where it's going in the future.

1

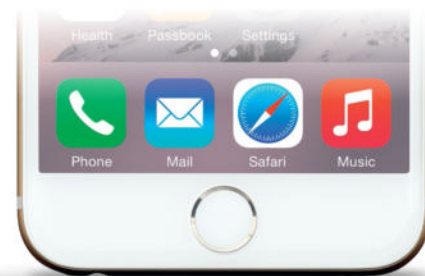
## NeXT

This is the big one: not only did Apple get the NeXTSTEP OS – the basis for both OS X and iOS – when buying NeXT, it also

brought Steve Jobs back to Apple. He cut back its product lines massively, and pushed Jony Ive to prominence, working with him on friendlier, sharper designs and new markets.



NeXTSTEP looks a bit old now, but OS X and iOS still have its blood coursing through their veins.



Touch ID is becoming more important than ever for iPhone users, and it's thanks to AuthenTec.

2

## SoundJam

To build iTunes, one of the most important apps in Apple's history, it bought this Mac MP3 player, before adding a bit of Cupertino magic.

3

## PA Semi

Having its own custom-made chips in the iPhone lets Apple add powerful unique features, and buying this semiconductor design company was key.

4

## Fingerworks

What would the iPhone or iPad (or even Mac these

days) be without gesture controls? That's what Apple got in this company.

5

## AuthenTec

Buying this security company gave Apple not just the tech for Touch ID, but also to make services such as Apple Pay safe.

6

## PlaceBase

The first of many mapping companies Apple bought, this brought in a suite of information from which to build its own Maps app. If there really will be an Apple car (see p22), PlaceBase's data will have been a vital first step.



## >GAME LOOP

When big-name game releases are technical disasters, **BRIANNA WU** says it's all to do with the fact that OS X is being ignored as a platform



**THE FINAL FANTASY** franchise is the crown jewel of Square Enix. The 2013 Windows reboot of Final Fantasy 14 made a shocking amount of money, stabilizing a company that had long been in financial freefall. The first major expansion, Heavensward, was released on PS4 and Mac this month. But the graphics performance on Mac was so terrible that the company pulled it from sale.

It wasn't the machinations of Kefka, Sephiroth or Ultimecia that devastated the Mac launch of Final Fantasy 14: Heavensward. Rather, it

### When I visit colleagues in AAA studios, I see offices filled with nothing but PCs

was the poor performance of OpenGL that cast a sleep spell on our graphics and got the whole party killed.

The irony of the blown launch was the recent announcement of Metal by Apple. Metal was built to solve the problems Heavensward ran into. In their *mea culpa*, Square Enix noted that if they'd taken the effort to code it natively OpenGL, it would have only had a 30% hit to performance. Instead, they ran it through Cider, a software layer that

adapts Windows code to run on Macs, and the result was unplayable.

One could certainly talk about the need for technologies like Metal on OS X, but I want to be clear about this. The real problem is that game companies just don't take Mac game releases seriously.

A big part of it is the culture of game development. Often, when I visit colleagues in AAA studios, I see offices filled with nothing but PCs. Many developers I know don't use or respect OS X. That's fine when it's a choice of what system they use at home, but that disrespect bleeds over into a lack of knowledge on how to port games to OS X.

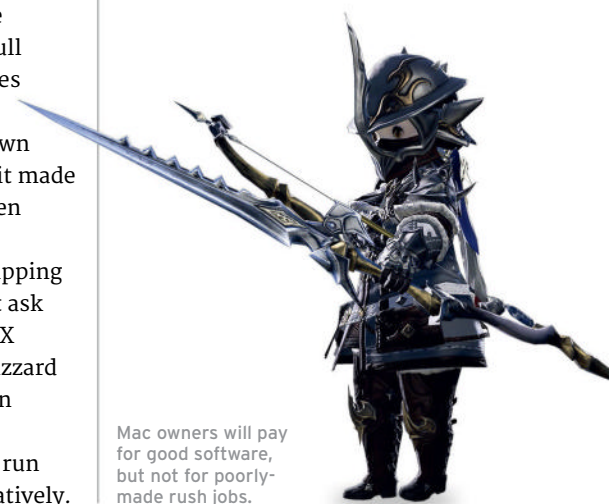
**IDEALLY, EVEN IF** the developers don't use Macs, a good playtesting department would catch these problems, and have enough pull with engineering to get changes made. Whoever playtested Heavensward had to have known about the problems – and yet it made it to launch. It should have been cancelled, or at least delayed.

You can make money by shipping great experiences on Mac. Just ask Blizzard if Hearthstone on OS X has been good for revenue. Blizzard tends to release their games on Mac alongside their Windows counterparts. And they aren't run through Cider, they're built natively.

Play the new Heroes of the Storm (see p81 for a review), and you'll find the performance excellent.

That being said, Blizzard has long had a reputation for only releasing excellent work. Their commitment to polish applies to everything, game testing, mechanics, and especially performance on average systems. That's the standard all Mac game development should aspire to.

PC gamers are notoriously price sensitive, many being unwilling to pay for a game unless it's dirt cheap in a Steam sale. One of their biggest complaints about Final Fantasy is the \$13 per month subscription cost. My bet is Apple fans would happily pay that – but only if you put the work into it. Square Enix, it's time to level your OS X dev skills.



Mac owners will pay for good software, but not for poorly-made rush jobs.

>>> Brianna Wu is the head of development at Giant Spacekat, developer of Revolution 60 on iPhone and iPad, and is a regular speaker at industry events, as well as host on the podcasts Isometric and Rocket.

# CRAVE

THE GEAR WE'RE LUSTING AFTER



**1 Ninebot One E+**  
ninebot.com  
\$950

>>> With its sleek black and white styling, this looks like it could be from *Oblivion* or *I, Robot* or *Moon* or the end of *WALL•E* or... wow, a lot of films look the same. Where were we? Right! The One E+ is a single-wheel self-balancing scooter, for carving your way through the city on your commute at a breezy 13 miles per hour, traveling about 22 miles on a single charge. It's what the Segway could have been if it hadn't ended up as the international symbol of the socks-and-sandals crowd.

## 2 **Dxo ONE**

dxo.com

\$599

>>> Like taking photos on your iPhone? This blows its built-in camera out of the water. (Also, you really should stop using your iPhone underwater.) It's basically a screen-less camera that plugs into the Lightning port on your iPhone, so you can shoot using its awesome 1-inch sensor - much larger than the iPhone's. This means crisper, more detailed images, with better performance in low light and more control over depth of field. It shoots raw (to a built-in memory card), but transfers JPEG shots to the iPhone. The only downside? It costs as much as a full separate camera.



## 3 **OWC USB-C Dock**

macsales.com

\$129

>>> Everything's going the way of USB Type-C. You can fight it all you like, but the MacBook was just the beginning. How will you connect all your old devices to future Macs, then? OWC's hub makes for a great desktop dock solution. It's powered from a wall socket (so provides power to your MacBook), and offers four standard USB connectors, two USB-C (one to connect to your computer, one for other accessories), Gigabit Ethernet, 4K HDMI output, microphone in and headphones out. When it arrives in October, it'll come in gold, silver and Space Gray to match MacBook colors.



## 4 **Gramofon**

gramofon.com

\$79

>>> Want a multi-room speaker setup for cheaper than a Sonos system? Gramofon aims to do this by offering a connected, multi-room audio system for under 80 bucks. Aside from offering Wi-Fi streaming (which is farther-reaching and higher-quality than Bluetooth) and integration with both your devices and numerous cloud music services, Gramofon enables you to connect up your home audio for a very affordable price. It looks pretty sweet, too. Sonos, watch your back.





# \$50 iTunes Card

How would you blow 50 bucks on music, movies, books, TV shows, and apps?

BY MATT BOLTON



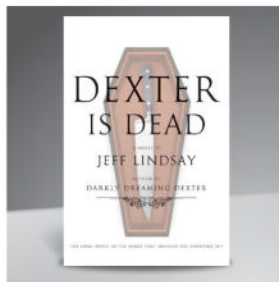
1

## HOME

Rihanna, Jim Parsons, Steve Martin

**\$14.99**

This “odd couple” film from Dreamworks isn’t especially original, but is still an enjoyable way to spend an afternoon with the family. Parsons plays Oh, a member of a high-tech alien race staging a friendly invasion of Earth so they have a place to hide from their sworn enemies. When Oh is cast out by his race for accidentally revealing their location, he teams up with Rihanna’s Tip, a girl separated from her mother in the invasion confusion. The whole deal is silly, colorful and kid friendly, though there are some good comedy moments for adults, including Steve Martin’s excellent alien leader.



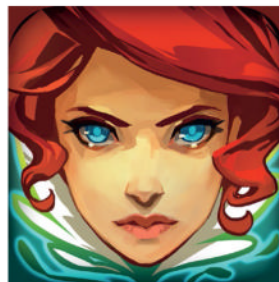
2

## DEXTER IS DEAD

Jeff Lindsay

**\$12.99**

Though “lovable” serial killer Dexter’s story finished on TV a few years ago, the original book series that spawned it now reaches a conclusion of its own. The Dexter books and TV show diverge dramatically after the first book, so if you’re a fan of the TV show, the series is definitely worth checking out from the start, though it can be odd, with some almost explicitly supernatural elements. In this finale, Dexter finds himself at the mercy of poetic justice as he is placed on trial for a murder he didn’t commit, losing the support of the friends and family he’s strived to build. Is this the end of his journey with his Dark Passenger?



3

## TRANSISTOR

Supergiant Games

**\$9.99**

Released on Mac a little while ago, this action RPG is a new arrival on iOS. Our review described it as “Beautifully presented, with a layered narrative and combat,” and that all holds true on iPhone and iPad. In it, you play as Red, a singer trying to make her way through a hostile city, with only a giant talking sword for company, which narrates the journey. As you fight on, Red gains new skills, enabling you to take on enemies more efficiently. Key to it all is that, while you can just run around attacking, you won’t last long. The trick is a pause option, where you can plan your next moves, queuing up your various attacks to awesome effect.



4

## COMING HOME

Leon Bridges

**\$7.99**

This gorgeous soul album is smoother than half-melted ice cream that’s been shaved with that Dorco six-bladed razor. Seemingly mastered to be a just a little flat, a little crunched, like recordings from 50 years ago, Bridges’ singing is heart-felt and the music punchy, swinging and unashamedly old-school in its style and instrument choice. It’s not some pale imitation of soul’s ‘60s heyday, though: it’s the real deal, just delayed by a half century.

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APPLE'S NEXT

# BIG THING

Deep in Cupertino, Apple's Research and Development division is hard at work on its next great groundbreaking products. Here, we look at the possibilities for its next big headline-grabbing releases...



BY MATT BOLTON &amp; ALEX BLAKE

# Apple Car

Is Apple really working on the  
“ultimate mobile device” in secret?



**S**INCE THE RUMORS began really swirling earlier this year that a major research operation relating to cars is underway at Apple, known as “Project Titan,” it has been dismissed as just new CarPlay features, new mapping solutions or better battery tech. But, as they say, there’s no smoke without fire, and Apple is producing thick plumes of the stuff. As we go to press, it has reportedly hired Doug Betts, former head of operations at Chrysler, and autonomous vehicle researcher Paul Furgale – all very reminiscent of it hiring luxury goods specialists while developing the Watch.

Some of it isn’t even subtle. At the Code conference, Jeff Williams, Apple’s Senior Vice President of Operations, responded to a question about what Apple might do in the future by saying “Well, the car is the ultimate mobile

device, isn’t it?” You might not think that’s worth taking seriously, but at the same conference back in 2013, Tim Cook, when asked about possible future wearable products, replied “I see [wearables] as a very key branch of the tree... I think the wrist is interesting. The wrist is natural.” The Apple Watch was announced 15 months later.

Still, even if you do believe Apple is working on car, it’s unclear exactly what it would release. Saloon, coupé, minivan... all of these? One thing that seems very likely is that it would be electric. Apple’s green credentials are well established, with the company now powering 100% of its own facilities from renewable energy sources – something it might aim to introduce to the automotive world, if it’s able to power a series of charging stations that way.

&gt;&gt;&gt;



A self-driving convoy from Volvo, with a range of vehicles taking cues from each other.

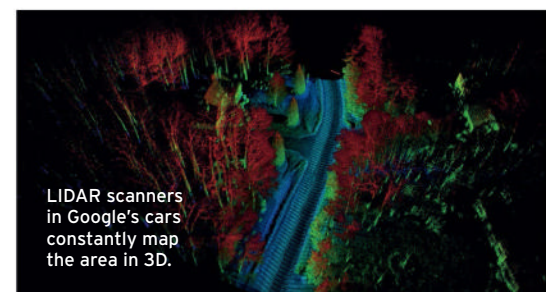
>>> Apple has invested heavily in ever more advanced battery technology, which led to it being sued by A123 Systems, a producer of electric car batteries, for poaching key employees for its own “large-scale battery division.” Though what we’ve seen publicly of Apple’s battery technology isn’t at the kind of level you’d expect to be used in cars, there are elements that may be important. Take the new MacBook for example, with its tiered batteries, designed to be used in curved casing shapes without wasting space – ideal for the aerodynamic lines of a car’s chassis, perhaps. The extra capacity from this might enable electric cars with larger ranges, or more compact cars.

The most exciting question about an Apple car, though, is whether you’ll

even drive it or not: self-driving cars are coming sooner than most people think. It looks like there will be a tipping point in about five years, which is roughly when Apple is predicted to launch its car. Dr Ken Washington, Vice President of Research and Advanced Engineering at Ford, recently stated: “Fully autonomous cars will be a reality within five years, if not sooner.” Google’s latest model of autonomous car is on the road now, with its fleet driving around 10,000 miles per week, and it also expects to have finished models ready in around 2020.

Though the idea of trusting a computer to drive a car is totally alien to many people, all the evidence suggests that self-driving cars will save lives. Google’s vehicles have been involved in several accidents,

but they’ve all been the fault of human drivers, not the car’s autonomous capabilities. Recently, two self-driving cars came into an awkward situation for the first reported time, with a Google car moving into the lane that an Audi self-driving prototype was about the pull into. And then... well, nothing happened. The Audi detected the Google car, stopped its maneuver



LIDAR scanners in Google’s cars constantly map the area in 3D.





## "INSTEAD OF OWNING A CAR, YOU WOULD JUST SUMMON A SELF-DRIVING ONE TO WHEREVER YOU ARE, AS IF USING UBER"

until it had passed, then carried on as intended without incident.

Exactly what technology Apple would use in a self-driving car is known only to Apple right now. There are many options, from Google's use of a roof-mounted 3D-scanning LIDAR system (bouncing light in all directions), to more subtle mixtures of cameras, lasers and radar around the edges of the vehicle, which many other manufacturers are trialing.



**IT MAY ALSO** be that self-driving cars don't just save lives, but also save you money. Consulting firm KPMG has issued a research paper predicting an 80% reduction in accidents after self-driving cars are widespread, with insurance costs dropping as a result of that by as much as 60%. But that makes the assumption that in

a full autonomous future, we'll all still own our own cars. Many of the companies involved think that's not the case.

Perhaps, instead of owning your own car, you'll just summon a self-driving one to wherever you are, as if using Uber (indeed, Uber looks set to be a pioneer of this tech). It turns up, takes you where you want to go, then disappears off, and you can just summon another one to take you back. You pay a few bucks for the journey, and that's it. No maintenance costs, no insurance, no parking woes. In fact, cities and homes might be able to reclaim the large amounts of space used for parking for new buildings or parks. You wouldn't have to worry about charging an electric car in this case – it would just be part of a revolving fleet of cars available to everyone.

Would Apple go for an approach like this? It's a massive departure from its existing business models, but Apple is all about delivering ease of use and convenience, and in cities especially, this would bring a huge amount of both. Apple is also one of the few companies with the money to roll out this kind of scheme on a huge scale.

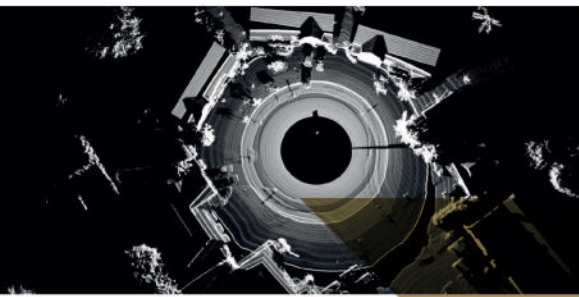
This may all sound a little too out there to be realistic for an Apple car, but we don't think Apple would get into the game with anything other



Google's self-driving cars are cute but very advanced – note the scanning dome on top.

than something completely industry-shattering. When people talk about why Apple wouldn't get into the car industry, it's often for reasons such as thin profit margins, or the upgrade cycle being so different that Apple's development model isn't suited to it – all of which assumes Apple plans to come into an existing market and compete there in the same way.

It won't. Consider the music industry: when Apple got into selling music for the first time, it wasn't by stocking CDs. It broke albums down into individual songs, letting people conveniently grab just the music they wanted, any time they wanted. Perhaps what we're about to see is the iTunes Store equivalent for cars.





# iPad Pro

It's likely to be super-sized –  
not to mention super-powerful

**T**HERE HAVE BEEN reports that Apple has ambitions to create a larger iPad, aimed at more productive use, pretty much ever since the original version was introduced back in 2010, but nothing ever materialized. In fact, Apple went the other way, introducing the smaller iPad mini, which is even more of a light entertainment device than its larger-screen sibling.

Still, the rumors never died, and since the announcement of iOS 9, it seems more likely than ever that Apple is about to introduce a larger-screen, more powerful iPad aimed at businesses and those who want more computing power for the ever more capable, desktop-class apps that are appearing on the App Store.

The major feature in iOS 9 that seems to point to the iPad Pro is support for split-screen apps, which enables two apps to run side-by-side on an iPad Air 2 (all other iPad models can bring in a second app using iOS 9's Slide Over option, but this isn't the

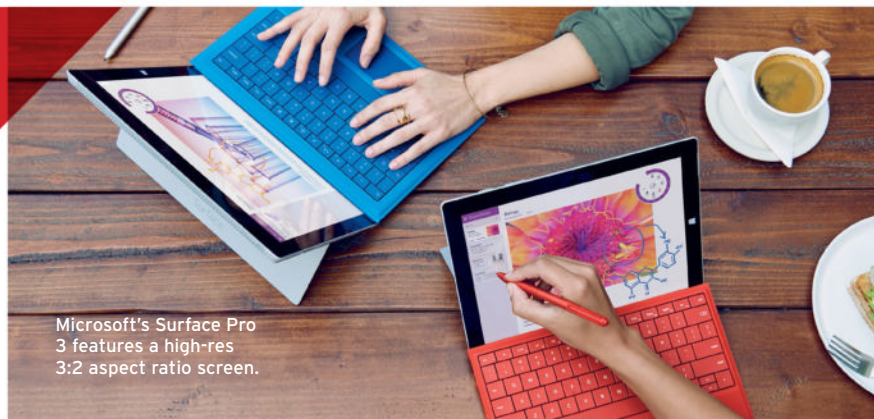
same level of multitasking). Both apps are live at once, and each can be used as if it were running at fullscreen, as apps do now. The iPad Air 2's powerful A8X chip makes this possible, with its 2GB of RAM and triple-core processor design – all other iPads have at best a dual-core processor and 1GB of RAM. There is one limitation on running these apps side-by-side, though: despite the fact that they run as full apps, they can't display as much as they would if they ran fullscreen, because running in one half of an iPad's display changes their size and aspect ratio. Forced into a different shape, their interface is limited, and this means that some complex creative apps simply may not be usable in this mode, with too much hidden.

**ON AN IPAD** Pro, with a larger screen, this limitation could disappear. Imagine an 11.2-inch tablet, with a resolution of 3,072x2,048 at an aspect



ratio of 3:2, instead of the 4:3 ratio used by all other iPads. This offers 25% more screen area than the iPad Air 2 without getting too large, and is closer to being widescreen than the fairly square current iPads. The 3:2 aspect ratio might seem strange, but it's actually the aspect ratio of the iPhone's screen up until the iPhone 5, and has been used in Microsoft's Surface Pro 3, where it was quite well-received. Still, why would Apple use it here?

It's all about the split screen. If you split a 3:2 screen in half, it becomes two 4:3 screens – meaning you could run two iPad apps side-by-side at their original size. If you split the resolution we've suggested in half in the same way, it becomes two screens of 1,536x2,048 – the exact resolution of current Retina iPads. The reason we



Microsoft's Surface Pro 3 features a high-res 3:2 aspect ratio screen.



Is this the shape of the iPad Pro?  
(To scale with an iPad Air 2, right.)

think it will be an 11.2-inch screen at that resolution is that it's literally two iPad mini 3 screens next to each other – it can be made using existing LCD panels, and app developers wouldn't have to do much to support it, since their apps would work at their best anyway. You could have GarageBand and another music app both running live, with one feeding audio to the other; or have Pixelmator open on one side and a file browsing app for your image storage service in the other, sending images to adjust to the former instantly once you've found them.

Of course, apps would require updating to run in fullscreen on this iPad, since it's not a 4:3 display, but there's the scope for them to use its extra width to help you be more productive – the Mail app could

offer an extra pane that shows a list of your mailboxes or folders alongside the inbox pane and message viewer it does currently, for example.



**SPLIT-SCREEN WASN'T** the only hint at an iPad Pro in iOS 9, though. Intrepid developers discovered a new on-screen keyboard layout hidden in its code that's much wider than would fit on a current iPad screen, including extra keys to the right and left of the letters, and this would work nicely on a larger, wider display. The standard keyboard now includes extra productivity options that are useful on current iPads, but definitely hint at a stronger focus on office or business work. There's even an intriguing hint that Apple may

intend the iPad Pro to be convertible into a MacBook-like device, with iOS 9 supporting more keyboard shortcuts from connected physical keyboards.

Another interesting business feature would be to include NFC technology, so that the iPad Pro could act as an Apple Pay (or other contactless payment) receiver, making it a useful portable payment unit.

There's also the interesting question of pressure sensitivity. It's likely that an iPad Pro would have Force Touch, but what about a fully pressure-sensitive screen for responsive, accurate drawing or editing in art apps, or better handwriting in note-taking and annotation tools? If it offers that, and a detailed screen in a portable package, it could be ideal for creative pros as well as enterprise types.

# Apple TV

Would Apple go 4K, or even make a games console?

**F**OR YEARS, TALK of an Apple television set was so fervent, it seemed like the hardware was just a matter of months away. Now, it feels increasingly unlikely. The TV market operates at razor-thin profit margins (which is not how Apple likes to do things), and there's little room to differentiate between products, since they're often based on largely the same technologies, with mostly the same online services available to them. Apple's current set-top box approach looks like it makes more sense, in no small part because it allows Apple to sell much more of them: if it's compelling, anyone can buy one to use with their current TV.

So, of course, there have been many rumors of a new Apple TV to replace the current one. What will it offer that makes it worth the upgrade, though? There are two possible additions that would require a hardware upgrade: full app support, and 4K output. The latter simply requires the right video decoder chips and HDMI 2.0 to be fully future-proof, and we think it's likely Apple will include it, if it can get the support from TV and movie companies. 4K TVs are starting to become affordable and popular, but the content

is still practically non-existent. If Apple could launch 4K movies in the iTunes Store for rent or purchase alongside the launch of the Apple TV, it could persuade a lot of people to start using iTunes regularly for movies (and charging more for the privilege). It would also provide a way to play 4K videos you've recorded from your next iPhone (we'll get to that).



**APPS ARE MORE** complex. Having an App Store would allow lots of video services to reach Apple TV users easily, which is great, and we'd probably see innovative new apps for TV use. We might also get features such as FaceTime on the TV.

The really thorny question is whether there would be games on the Apple TV. Between the creation of Metal for faster graphics performance and support for games controllers in iOS, many have seen this as likely for a while now. The issue is that the Apple TV would be far behind the tech in the Xbox One or PlayStation 4 in terms of power and technical complexity if it uses the same chips as iOS devices, so you wouldn't see

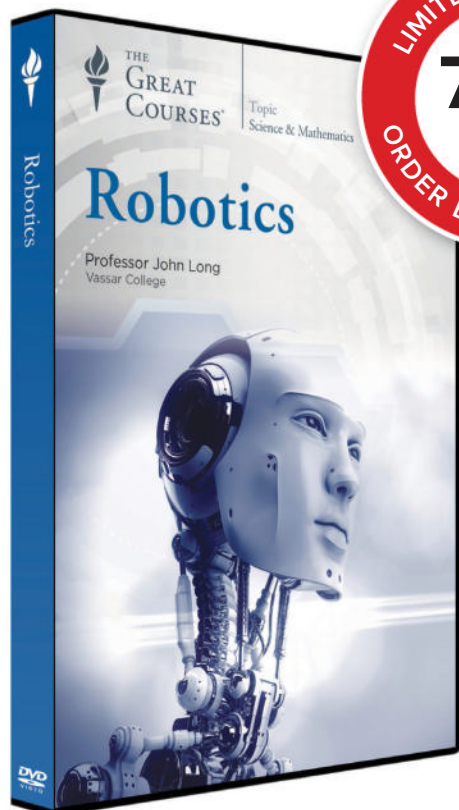
ports of the higher-end games available there. iOS games could fill the gap, sure, but the most successful iOS titles use the touchscreen to its fullest, and are great in short bursts rather than focused sessions – whether that translates to a console isn't clear-cut.

The last thing Apple could add to really boost Apple TV would be a video streaming service, akin to Apple Music, but for TV shows and movies. This has been rumored for a while, and is reportedly nearly ready to go at the time of writing. This is something that wouldn't be exclusive to a new Apple TV, though – users of the old model would benefit too. In fact, we think it's likely that the old Apple TV will stick around even if the new one appears, as a cheaper option.



Streaming services would be the lifeblood of a new Apple TV.





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7. Animal-Inspired Robot Behavior
8. Basic Skills for Making Robots
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17. Space Robots in Orbit and on Other Worlds
18. Why Military Robots Are Different
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## 4K iMac

5K a bit much? A 4K iMac could be just right

>>> There are rumors that Apple is working on an 8K iMac, but that feels a little... extreme to us, and pretty pointless, outside the needs of a vanishingly small number of video professionals. Look the other way, though, at a 4K 21.5-inch iMac, and it seems much more likely. The expectation might be that we'd simply see the resolution of the current 21.5-inch iMac doubled, making it a UHD-standard 4K resolution of 3,840x2,160, but there's code in OS X El Capitan that makes reference to a

default resolution of 4,096x2,304 – a display size no other Mac uses. This actually makes sense, because it's basically what you get if you take the 5K iMac's 27-inch panel and make it 21.5 inches instead, so it would be technically easy for Apple to do. So why haven't we seen it yet? Perhaps Apple is waiting for Intel's next series of desktop processors, or even Thunderbolt 3. We wouldn't be surprised to see it before the end of this year, though.

## A-series Macs

Is it just a matter of time before an Apple-made chip powers a Mac?

>>> Apple has turned itself into one of the most advanced mobile chip designers in the world over the last few years, producing processors that consistently outperform anything else. But will it put those chips in Macs? It's starting to look more likely than ever, though maybe not across the whole range.

Intel's expertise with extremely complex, powerful chips means it would take Apple a long time to catch up with it when it comes to pro-level products, but the A8X chip in the iPad Air 2 is already pretty close in performance to the low-power Intel processor in the new MacBook. In a couple of years, Apple's chips may well

match Intel's at the low end, and be much cheaper to use, too – maybe enabling the MacBook's price to come down to where the MacBook Air is now.

One of the biggest issues with putting an Apple chip in Macs is that, even with OS X made to run on them, apps would need to be reworked to be compatible – and that was a painful process in the switch to Intel. But Apple has a new secret weapon here, named Bitcode. This technology reads the programming language which apps on the App Store are written in and turns that into Bitcode, which can then be recompiled into a new app that's compatible with any

processor architecture. If they include Bitcode compatibility now, developers' future apps could work on any future Apple hardware without any changes made at all. Solving this key issue is possibly the biggest sign yet that A-series Macs are on the horizon.



# iPhone 6s

More of the same, only better

>>> At the time of writing, we've already seen a leaked iPhone 6s case, with only boring internal changes such as slightly tweaked logic board connections, so it's looking unlikely that we'll be surprised with an early redesign of the iPhone this year. There will, of course, be changes to make your year-old phone feel

obsolete, though! We've no doubt that Force Touch will be added to the iPhone, giving apps an extra level of interaction to work with, and we'd expect the Taptic Engine (or something like it) to be included as well, giving feedback on deep presses, but also being available for developers to use as part of

their app interfaces. An updated camera is all but certain, too. It's likely that we might finally see the iPhone go past eight megapixels – a 12-megapixel camera that can record 4K video (and 1080p video in proper 120fps slow motion) would be a tempting boost over what's there now.

# iPhone 7

How will Apple push the boundaries in its next phone?

>>> The iPhone 6 and 6 Plus had a change in size as the driving force of their big design shift, but we think it's likely Apple will keep the same sizes for its next phone, giving it the chance to refine it in other ways. We expect to see Jony Ive's relentless quest for thinness to continue, and many of the tech changes might reflect this.

We could see Apple adopt an OLED screen, of the kind used in the Apple Watch. Because they don't require backlighting, OLED displays are thinner than LCD equivalents, and are battery-friendly because black pixels can be actually turned off – and if a thinner iPhone has limited space for batteries, that may be vital. It might allow for an edge-to-edge display, too. Perhaps we'll even see a tapered design, letting Apple make use of the tiered battery technology in the MacBook.

One thing we definitely don't expect to see on the iPhone 7 is that camera lens protrusion on the back – which Jony Ive publicly described, with classic British understatedness as, “a really very pragmatic optimization.” Apple has a patent on a fascinating new kind of camera design that might avoid the need for awkward lumps, though. It's based on three different sensors, each capturing a different light color. They're then combined in the final result, and because each one is focused on a particular kind of light, there would be less cross-talk between the pixels, meaning crisper images.

We might also see Apple put its exclusive contract with LiquidMetal to good use. This amazing material can make very thin and awkward designs very strong, and it can even act as an antenna, so no more rubber lines.





# GET READY

We dive into Apple's plans to make iOS the center of your domestic domain and life - creating smart homes for everyone

BY CRAIG GRANNELL

# FOR HOMEKIT





**BACK IN 2001**, Steve Jobs talked about the “digital hub” strategy, placing the Mac at the heart of your home – at least as far as music and films went. But with

HomeKit, Apple’s ambitions go significantly further, aiming to turn your iPhone or iPad into an engine that drives potentially countless smart accessories around your home.

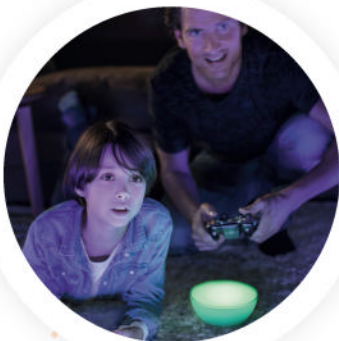
It’s science-fiction thinking arriving in reality – tapping on a device to remote-control lights, locks, heating, garage doors, power outlets, cameras, and much more. Granular context-oriented groupings in HomeKit will enable you to define rooms, zones and scenes to control.

Of course, the idea of home automation isn’t new, and many products are already on the market. But the ecosystems are fragmented and few champion ease of use. By contrast,

those already immersed in HomeKit strongly believe Apple offers something different.

“With HomeKit’s Siri integration and ease of configuration, it’s a breeze to set up and use,” says Carlos del Toro, Director of Product Management at Incipio, a company working on several HomeKit products. “The framework offers seamless interoperability with apps and devices across brands. You’ll simply scan for devices and connect. The HomeKit framework securely takes care of the rest.”

Carlos envisions a future where “HomeKit-compatible appliances and devices will be the norm at retailers,” offering complete control of your home with natural speech and proximity-based action sets. And although HomeKit was revealed at WWDC 2014, products are now appearing that enable us to, as Carlos puts it, “use HomeKit to enhance our daily lives.”



# How HomeKit works

The ins and outs of Apple's home automation system



**APPLE HAS MADE** it clear that usability is at the forefront of HomeKit. On stage at WWDC 2014, Senior Vice President of Software Engineering Craig Federighi said Apple's aim was to "bring some rationality" to the world of home automation, which had a tendency to intimidate people with its networking protocols and security mechanisms.

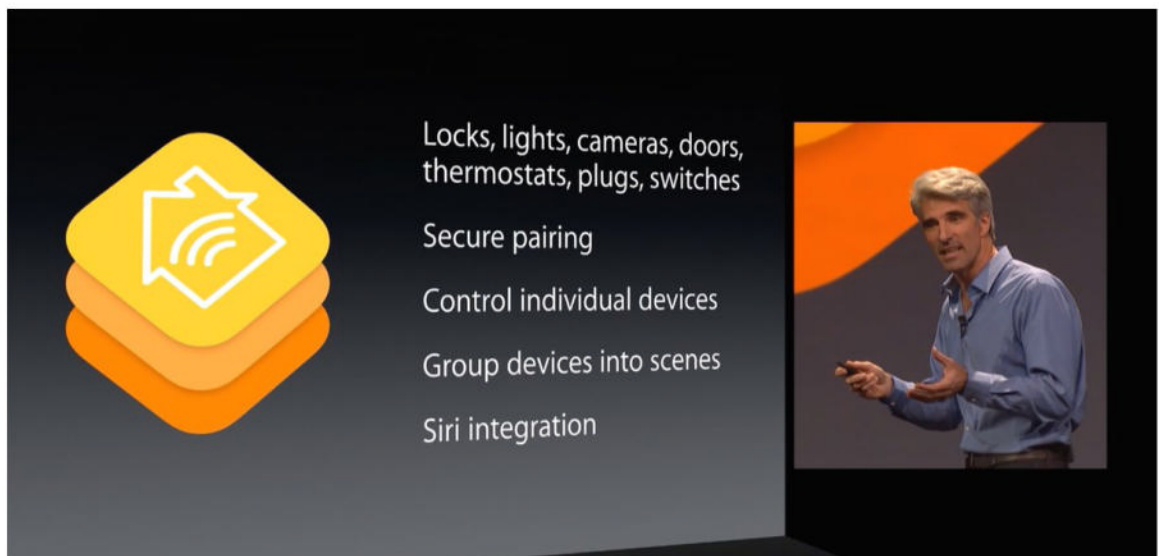
HomeKit provides a framework that developers can tap into to provide you with the means to set up and manage a smart home. This will all be done from your iOS device, which will communicate with accessories over Bluetooth Low Energy (BLE) or Wi-Fi. While you'll have to spend some time determining said setup (see Managing Rooms on page 36), the time-savings and convenience when done will be considerable.

Federighi explained that you'll be able to say to Siri something like "get ready for bed" and know your garage door is closed, front door locked, thermostat lowered and lights dimmed.

Commands to smaller, user-defined groups or just single HomeKit-enabled products will be possible, and Apple's developer documentation talks about creating timestamped repeat triggers. Usefully, definitions will synchronize over iCloud if you own multiple devices.

Additionally, Apple has confirmed that you won't need to be within your home Wi-Fi network to control your devices, provided you have an Apple TV at home. Apple's little black box will act as a door to the internet, providing an entry point into your network when you're sending commands from anywhere else. Your voice commands will be sent to your Apple TV over the internet, and passed on to your accessories.

HomeKit isn't designed to work with every smart home product on the market – only those that are confirmed compatible and approved by Apple – but third-party hardware bridges are available to connect certain non-HomeKit smart home accessory systems, albeit with some limitations imposed – see Security and Privacy on page 37.







DEVELOPER INTERVIEW

## Florian Albrecht

Elgato's Director of User Experience tells us about working with HomeKit

**MacLife:** What is the main advantage of HomeKit?

**Florian:** Apple is about bringing great user experience to technology products. We believe HomeKit has the potential to make home automation accessible to the mainstream. Many competing and proprietary standards already exist, but none puts the main focus on the end user. HomeKit is designed to be simple, consistent and secure, keeping the data about your home private.

**ML:** What are your thoughts on HomeKit?

**Florian:** By providing common protocols, certified hardware and an SDK, HomeKit enables companies to do what they do best. It lets hardware vendors focus on delivering great sensor and control products, and it gives software companies the opportunity to innovate on apps in a way most traditional hardware companies can't. Elgato has a strong hardware and software background. We're confident that we can make a meaningful contribution that will delight all users of HomeKit.

**ML:** How did you find working on a HomeKit product?

**Florian:** Adopting new technology at an early stage results in both unique challenges and also unique opportunities. Implementing the security mechanisms required by HomeKit was a task that required lots of focused effort, especially since our devices are battery-powered. Ultimately, this level of care is great for the end user, the ecosystem and the devices that we create.

**ML:** What are your hopes for the future of working with HomeKit and for people using HomeKit products?

**Florian:** We believe HomeKit will enable a new category of consumer-friendly home automation products, both for individual users and also for Elgato as a creator of such products. From the experiences we have gathered creating these accessories, we're thrilled to see this ecosystem get started and can't wait to be a part of it.



# Managing rooms

Get into the zone with HomeKit – and also the scene, home and room



**HOMES** PROVIDES several layers of flexibility regarding the layout of your home automation accessories and devices. Layouts are based around the concepts of “homes,” “rooms,” and “zones.” A home is the largest container, representing a single dwelling and guests can be granted limited access to a home. It’s possible to add multiple homes to HomeKit – your actual home and your office, for example, or multiple holiday homes if you’ve the wealth of a typical Apple exec! One must be set as a default for Siri commands that don’t specify a home.

Each home may have multiple rooms within, and these need to be given meaningful and distinct names, such as “living room” and “kitchen.” If a home has

two similar rooms that perform the same function, you’ll need to name them differently, in order for Siri to recognize them when you’re issuing commands. For example, you can’t have two rooms called “office,” or several rooms called “bedroom.” Within each room, there can be multiple accessories, which again should all have unique names. So you may need to get a bit creative if you get carried away in the Apple Store.

**GET IN THE ZONE** – Because people tend to think of certain areas of their home as one, Apple offers an easy way to group rooms and accessories into “zones.” This provides the means to give Siri elegantly simple commands to perform complex actions. The zones can

be an arbitrary collection of rooms, say “upstairs,” “downstairs,” or “bedrooms.” Any of the rooms you’ve defined in your HomeKit setup can be added to one or more zones. A handy scenario for a zone would be to use a single command to turn off all of the downstairs lights, rather than having to remember the various names of all accessories and dealing with them individually.

**MAKE A SCENE** – HomeKit’s other grouping option is the “scene,” which is even more powerful than the zone.

A scene also happens to be more granular, since it can include an arbitrary number of actions defining the settings of specific accessories, rooms or zones. Apple’s developer guidelines suggest you might create a scene called “away” that would lower your home’s temperature, turn off all the lights and lock the doors. The opposite to this might be a “party” scene – unlocking your front door, turning on your music system, powering up that extra drinks fridge

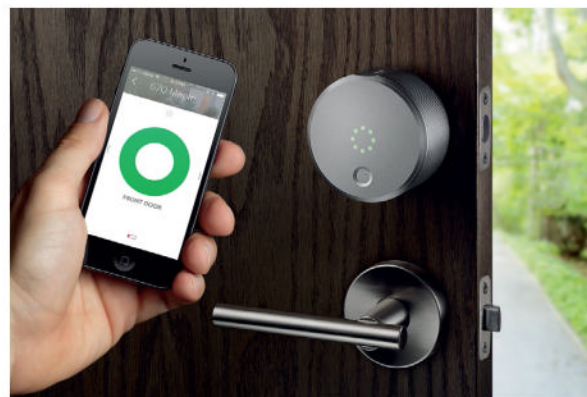


## > Security and privacy

Since HomeKit may become instrumental for controlling and securing homes, security and privacy are core to the system. The creator of a “home” is the administrator and can perform all operations, including adding guests (such as visiting family members). Guests must have their own device, and an Apple ID with an iCloud account that matches the one provided by the admin. These users cannot modify

layouts, but can make basic changes and execute actions.

Apple’s ensured secure pairing and end-to-end encryption between your accessories and your iOS devices. HomeKit-compatible products must be approved by Apple and part of the Made for iPhone (MFi) program. Bridged products must also be MFi-approved, and may have restrictions placed on them: for example, the likes of non-



HomeKit door locks will reportedly be blocked entirely.

Apple rules are similarly strict regarding apps used to control accessories. Any in use must run in the foreground, excepting approved triggers.

It’s forbidden for apps to gather and store info about your home and its accessories. And apps must be focused on home automation, ensuring not just any app can access HomeKit data.



Of course, your HomeKit connected products will be controllable from your favorite Apple wearable.

in the kitchen, dimming your normal lighting and setting your colored lights to “disco mode.” Raised an eyebrow while reading this? The concept’s already well and truly here – just check out Hue Disco on the App Store!

Precisely how room management will be achieved wasn’t fully clear at the time of

writing. Apple might add a “Home” app to your iOS device, akin to the Health app, for accessing data. Alternatively, it might be something only accessible from within HomeKit accessory apps, either using the interface of the app itself or a system-wide Apple-defined interface, like the iOS Document Picker.



# HOMESKIT DEVICES

The home  
automation  
accessories we're  
excited about



## 1 ECOBEE3

\$229 [ecobee.com](http://ecobee.com)

**What is it?** A smart thermostat, enabling you to check and adjust your home's temperature from iPhone or Apple Watch.

**Why are we excited?** Using ecobee3's remote sensors, it keeps accurate tabs on how warm every part of your house is, so no energy is wasted. It monitors the weather and your schedule, so it's comfortable without being wasteful.

## 2 INSTEON HUB PRO

\$149 [insteon.com](http://insteon.com)

**What is it?** This hub can control everything from lights to power adapters to wireless cameras to smart locks to thermostats, and the unit is HomeKit-enabled.

**Why are we excited?** The most comprehensive system here, offering power control, lighting and more. It's extendable, and there are even wire-in modules for controlling pool pumps, ceiling fans and more.

## 3 INCIPIO DIRECT WIRELESS SMART OUTLET

\$25 [incipio.com](http://incipio.com)

**What is it?** A power outlet you'll be able to control from your iOS device, by using in-context Siri commands, or even through proximity - eg, powering up electronics on entering a room. Lamp adapters and powerstrips are imminent.

**Why are we excited?** Because remote control outlets will save time and energy in the home.



#### 4 LUTRON CASÉTA WIRELESS SMART BRIDGE

\$119 [casetawireless.com](http://casetawireless.com)

**What is it?** A smart light system, with this bridge as its central point. Lutron offers a range of bulbs and attachments for controlling your lights centrally, and now you can use Siri to control it.

**Why are we excited?** The Caséta bridge can also control some electronic shades and Honeywell smart thermostats.

#### 5 ELGATO EVE

From \$39 [elgato.com](http://elgato.com)

**What is it?** A range of sensors, designed to provide environmental data, such as energy consumption, temperature and air quality, as well as a power outlet adapter, for controlling an attached appliance or just monitoring its electricity usage.

**Why are we excited?** It will help you make informed decisions regarding energy use.

#### 6 SCHLAGE SENSE

\$TBA [schlage.com](http://schlage.com)

**What is it?** We've seen quite a few smart locks of late, especially on crowdfunding sites. But Schlage's ticks more boxes than most. It's designed to work with HomeKit, and enables entry using your iOS device or a programmable touchscreen. Available soon.

**Why are we excited?** Because we'd like our house to welcome us, and not have to fish for keys.

#### 7 PHILIPS HUE

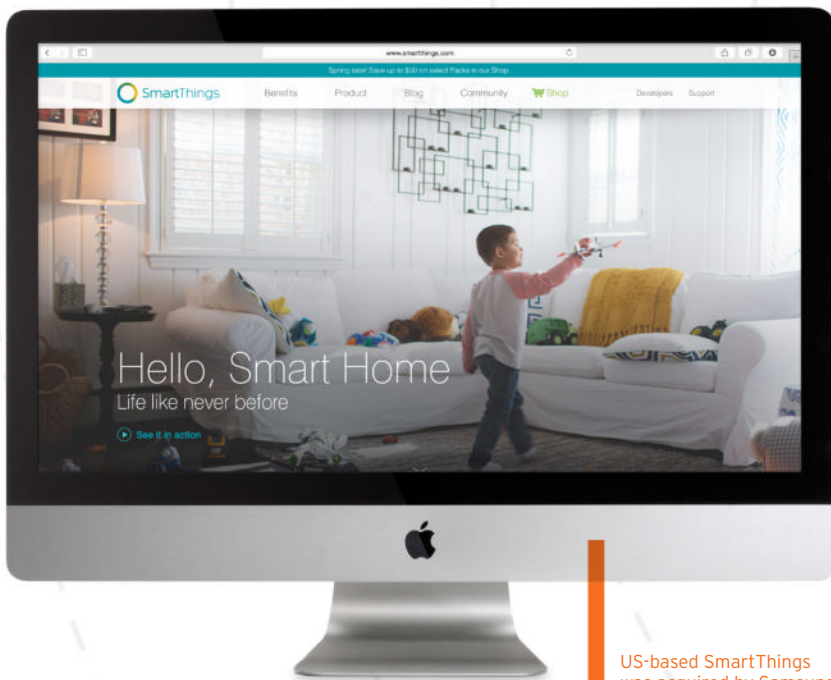
\$200 (for starter pack) [philips.com](http://philips.com)

**What is it?** Wireless lightbulbs. Control your lights from your iOS device wherever you are, transforming your room's feel in seconds. HomeKit support is incoming - existing users might need a new bridge unit, though.

**Why are we excited?** Really? Because of the convenience, flexibility and sheer geeky joy of the system, of course!

# HomeKit alternatives

Apple's not the only company in the home automation game...



US-based SmartThings was acquired by Samsung and provides an open platform which does a lot of what Apple's aiming for with its HomeKit system.



**H**OME AUTOMATION is in its infancy, and so a perfectly viable alternative to HomeKit at this stage is to avoid complex setups entirely, and instead concentrate on a few individual pieces of technology you think will improve your life right now. For example, while the Withings Home Smart Camera and Philips Hue are both intended to fit into a HomeKit set-up, they work perfectly well as they are. Place a Withings Home in a room and it'll send live video and imagery to an iPhone, along with alerting you regarding movement – it'll even send these things to an Apple Watch. Likewise, the Philips Hue has long been a *Mac|Life* favorite, with its iOS app providing an

elegant and simple means of remotely controlling home lighting.

**ALL POWERFUL?** – However, the more devices and gadgets you accumulate, the more you're going to want to make them work as one, and there are plenty of competing protocols and standards. Z-Wave and ZigBee are two popular communications protocols that can be used in home automation kit. The former's website talks of leading brands being powered by it. The latter calls itself the "only open, global wireless standard to provide the foundation for the Internet of Things."

**APPLE ECOSYSTEM** – Really, though, protocols are only part of the puzzle. What makes HomeKit isn't the protocol itself, but the fact it's part of an Apple ecosystem. As someone armed with an iPhone, you'll just grab a piece of MFi-certified hardware, knowing it should

work with your home set-up. The two names most likely to take on Apple in that sense are Samsung and Google. Samsung has made major inroads into home automation over the past couple of years, integrating it into the company's products. This was further cemented by a 2014 acquisition of SmartThings ([smarththings.com](http://smarththings.com)), a US-based company building an open platform for smart homes. Through the SmartThings Hub and free app (iOS, Android and Windows), you can add and use whatever devices you want, customizing your smart home.

Google, too, looks set to battle Apple for the future of home automation. While its Android @Home system seemingly stalled, the company bought the





popular Nest smart thermostat. Nest has since branched out into related products and a “Work with Nest” program. This enables smart accessories to work with Nest in all kinds of ways, including toggling lights when the thermostat is in “away” mode during your holidays, and flashing Hue lights to get your attention when a Nest Protect smoke alarm senses something’s wrong.

Late last year, Nest formed a working group with Samsung and several other companies to release Thread ([threadgroup.org](http://threadgroup.org)), a networking protocol it describes as “the very best way to connect and control products in the home.” It’s promoted as being completely secure and without a single point of failure, along with essentially solving every problem, ever, for connecting products around the home.

At this point, your head might hurt from all the choice and it is impossible to know how everything will shake out. Google in particular seems well placed to take on HomeKit, not least with its rapidly improving software design smarts and ownership of Nest. Samsung, too, is an industry giant that manufactures televisions and a huge range of home appliances.

**FLUID FUTURE** – However, Apple has advantages of its own. It’s taken the time to get HomeKit right, boasts superb brand recognition and satisfaction,



Nest has combined with Samsung and other tech companies to form Thread, a working group for connecting Android-controlled home products.

and also has a history of creating ecosystems in which outside companies can flourish.

We’d say the future of home automation is fluid. If you simply cannot wait for a gadget, by all means buy it now if it’ll happily work with your existing iOS devices. Otherwise, hang on for HomeKit proper if you’re wedded to Apple, or investigate alternatives (notably SmartThings) if you’ve a very mixed-use household in terms of smartphones and accessories.





# GET INTO 3D PRINTING

3D printing's time has come! We talk you through the tech, reveal the best tools, and show you how easy it is to make your first print **By Dan Oliver**



**TECHNOLOGIES OFTEN** simmer under the surface before emerging into the

mainstream. And in the case of 3D printing it's taken over 30 years to finally come to the boil.

Held back by high costs and restrictive patents, 3D printing has been waiting patiently in the wings for its moment in the spotlight, but with prices dropping and options increasing, that moment is now upon us. It's time for 3D printing to take center stage.

A study from CSC ([csc.com](http://csc.com)) published in March, and featured in *Forbes* magazine, predicted that by 2020 the global 3D print industry will be worth \$8.6 billion. And with prices expected to drop

by 50% in the next five years, and speeds to get 400% faster, it's only going to get more practical and useful over time.

Now, with the likes of Canon, Dell, Adobe, HP, and Microsoft creating their own apps and hardware, there's a burgeoning interest in 3D printing that goes beyond its hitherto niche audience; it's about to go mainstream, and there's never been a better time to get involved.

In this feature we're going to take a look at the fascinating story behind 3D printing, uncover some of the best printers and tools for Mac users, walk you through your very first print, and reveal why so many people are catching the 3D print bug!



## THE 3D PRINTING REVOLUTION

From a research team at a UK university, to homemade firearms, to a community at loggerheads over open source, 3D printing has a fascinating story to tell



**HEN CHUCK HALL** developed the principles of 3D printing back in 1984, *Ghostbusters* was the world's favorite movie and

Apple was launching its first Macintosh computer. Due to high costs and a number of patents that only expired within the last decade, though, 3D printing was the preserve of a handful of people in the manufacturing industry.

But in 2005, a UK university lecturer started a quiet revolution. "When 3D printing came along I realized that, for the first time, humanity had a manufacturing technology that stood a reasonable chance of copying itself, and so I started RepRap,"

recalls Dr. Adrian Bowyer, founder of the RepRap (or "replicating rapid prototyper") Project. "I received the smallest research grant of my entire 40-year academic career, £20,000, which was less than the cost of a cheap 3D printer at the time."

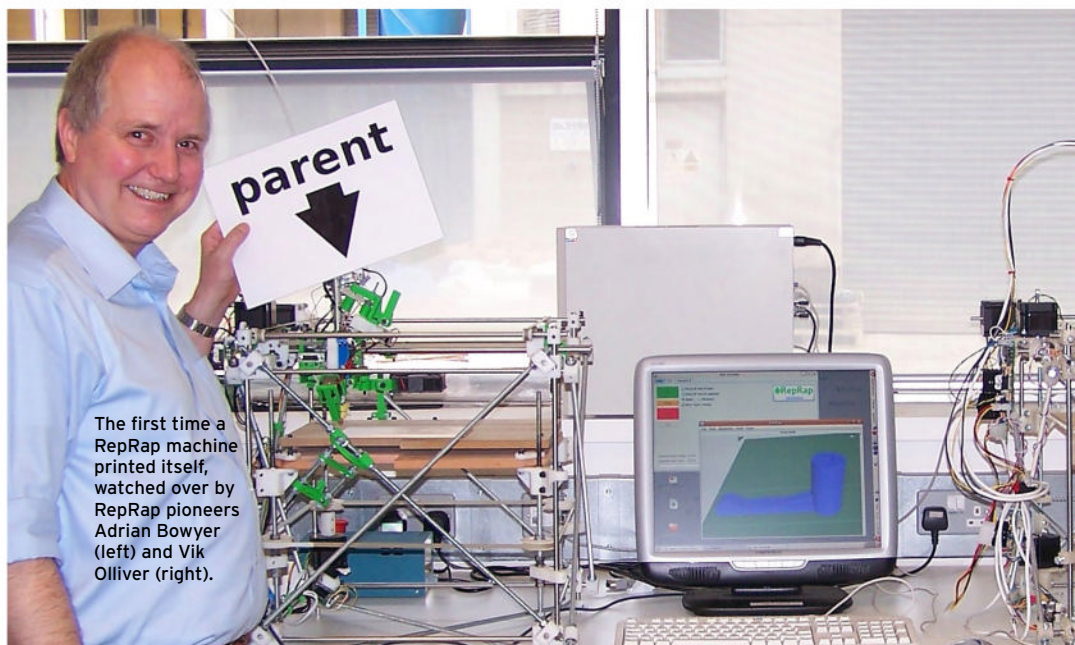
As the RepRap Project grew, and the team developed the precursor to many of today's desktop printers, it brought with it an open source ethos, with all printer designs being made available under the GNU General Public License. This ethos was core to 3D printing's early success.

"We believe this community was essentially born from – and is still driven by – a desire to change the world for



### SPIRAL VASE

Our first featured model is a vase by Martin Žampach. This is a great example of a print that's well designed for most printers – with no nasty overhangs – and it's also visually interesting and functional. And because it's hollow, it prints surprisingly quickly (though speed is relative with 3D printing, and you're still looking at a number of hours). You can grab it here: [thingiverse.com/thing:481259](http://thingiverse.com/thing:481259)



The first time a RepRap machine printed itself, watched over by RepRap pioneers Adrian Bowyer (left) and Vik Olliver (right).

the better,” says Diogo Quental, CEO of Beeverycreative, a leading printer maker. “This is something anyone can see for themselves when they visit a 3D printing show, where the atmosphere is far more collaborative than it is competitive.”

### A PERIOD OF RAPID GROWTH

This collaborative atmosphere kickstarted a period of rapid growth in 3D printer development. As other printer makers built on the technology, a host of new manufacturers emerged in explosive fashion. One of these companies, a company that’s both inspired and divided the 3D print community, is MakerBot. As the 3D printing movement began to coalesce around open source ideals and maker enthusiasm, MakerBot emerged as an early beneficiary, positioning itself as the poster-child of affordable, 3D printing.

“3D printing has been around for close to 30 years, but up until 2009, the industry typically offered large mainframe-sized 3D printers that cost hundreds of thousands of dollars,” says Andreas Langfeld, general manager at MakerBot Europe. “MakerBot changed that equation by introducing



In 2013, Cody Wilson became 3D printing's poster boy for all the wrong reasons. He made a fully working plastic gun and showed the world how to do it.

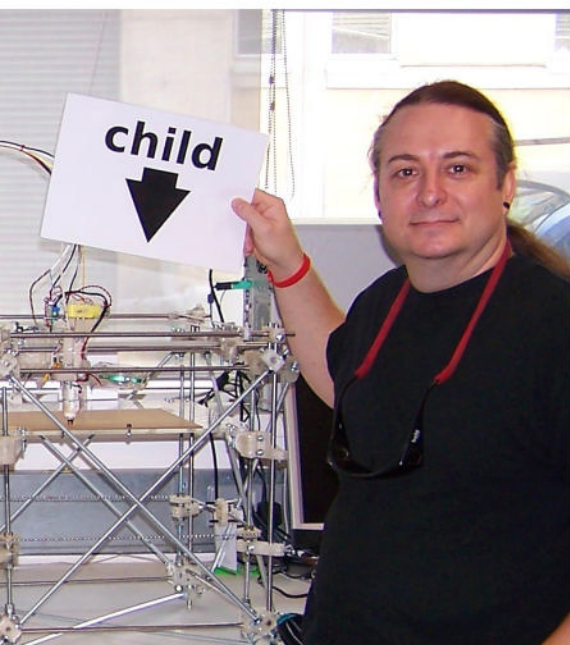
desktop 3D printers that are smaller and more affordable.”

The internet has been key in the spread of 3D printing, and it’s no surprise then that MakerBot, the world’s best-known 3D print brand, is also the company behind the world’s biggest 3D print community: Thingiverse.com. Launched in 2008, Thingiverse plays host to artists, designers, architects, inventors, and anyone else that wants to share and discuss 3D prints. By September 2012, the site had hit 20,000 model uploads.

### COMMUNITY BACKLASH

Sadly, as with most technologies, it was almost inevitable that this rapid growth would cause a fissure, and in the same month MakerBot made the cover of *Wired*, it turned its back on open source: “For the Replicator 2, we will not share the way the physical machine is designed or our GUI,” co-founder Bre Pettis explained at the launch of its newest printer, “because we don’t think carbon-copy cloning is acceptable and carbon-copy clones undermine our ability to pay people to do development.”

The terms on the Thingiverse site changed, too, to give MakerBot extensive rights to use, sell, reproduce and license uploads to the site. MakerBot’s community, many of whom had



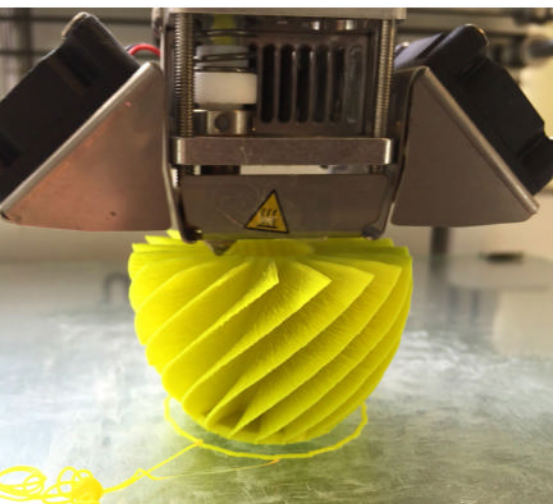
Some prints are criticized for being too rough. But as this skull pattern shows, highly intricate designs that are relatively smooth are possible to achieve at home.

contributed to the company's success, were not happy. And when Stratysys – the company that held the patent on FDM technology (one of the most important 3D printing techniques – see p48) for 20 years – bought MakerBot in 2013, many believed that the honeymoon period was over.

“Some of you may think that I am rather lax in my pursuit of those people who would appropriate RepRap technology and close it off, thereby breaking the terms of the GPL,” Adrian Bowyer wrote in a blog post at the time. “The reason that I am lax – and I am – is because I don’t care about those people. I don’t care about them because I know that by closing off the path that they have chosen, they have turned it into a reproductive cul de sac; they have made their machine sterile.”

#### FIRED INTO THE MAINSTREAM

Bowyer may have had a point, because MakerBot – which has undoubtedly done more than any other brand to popularize 3D printing – began to face increasingly stiff competition as new printer makers,



This spiral vase has a twisted conical fan shape. It's a great design for seeing how a 3D printer layers up.

## “THIS COMMUNITY WAS BORN FROM A DESIRE TO CHANGE THE WORLD”



#### T. REX SKULL

This two-part T. rex skull from MakerBot is brilliant fun, and is a great example of something that you can print to enjoy with your children. Printing in two parts, you can fit the skull together and the jaws can be moved up and down, and if you mix a bit of dark paint and water – as long as you’re printing with a white filament – you can apply a wash, which will make it look pretty authentic. Grab it here: [thingiverse.com/thing:373367](http://thingiverse.com/thing:373367).

such as Ultimaker, MakerGear, Lulzbot, Beeverycreative, and many more, continued to build on the work done by the RepRap Project. But despite all of this, 3D printing was still on the periphery.

Then someone printed a gun.

“For nearly three hundred years anyone has been able to own a lathe. Worldwide, millions of private individuals do, including me,” says RepRap’s Adrian Bowyer. “And lathes are really good at making guns – much better than 3D printers – and they always have been. No one has worried about this. Ever!”

Like Bowyer, many 3D printing enthusiasts were angered by the story, which positioned 3D printing in a negative way, but it came at a time when guns, and gun control, were grabbing headlines around the world. The story broke in March 2013, and just two months later the number of models available to Thingiverse had quadrupled to 100,000. For better or worse, it played a pivotal role in pushing 3D printing into the public’s consciousness, and it hasn’t been out of the news since.

Whether it’s stories of printed cars, spanners in space, or synthetic humans, we’re increasingly aware of what 3D printing is capable of. Desktop printers are now affordable, easy to use, and have widespread Mac support.



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## TECHNOLOGY, TESTED



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## HOW IT WORKS

Confused? Let's shed a bit more light on the dark art of 3D printing



Depending on what you're producing, and the amount you're willing to spend on a 3D printer, there are a variety of ways to print a 3D model. Some techniques involve lasers cutting through material, some fire UV beams at resin, but the most common technique is called FDM (fused deposition modelling).

FDM involves pushing heated filament (plastic, in most cases) through a tiny nozzle, building up thin layers/slices as it goes along. The more detail, the longer

it takes, as the printer needs to lay down more layers (measured in microns). In most cases, the filament used for FDM printers is either PLA or ABS, which are categorized as thermoplastics; this means they can be easily heated to a soft state, and then cooled to a solid. And you can buy these filaments from companies such as colorFabb ([colorfabb.com](http://colorfabb.com)) and 3d-filaments ([3d-filaments.com](http://3d-filaments.com)).

ABS filament requires a heated bed, otherwise it tends to curl, but it has a better strength and flexibility than PLA. PLA can provide more detail, warps less, comes in funkier colors, and gives off less noticeable fumes. PLA is plant-based; ABS is petroleum-based plastic.

You can create models in a CAD or 3D app (such as AutoCAD 360 or 3ds Max). Or, if you don't want to learn a pro app, Autodesk has an amazing suite of free, 3D tools available at [123dapp.com](http://123dapp.com). If you don't want to make your own model, thousands of ready-made models can be found via repositories such as Thingiverse.com (owned by MakerBot), Shapeways, i.materialise, Sketchfab and YouMagine.com (Ultimaker's 3D print community).

If you do design your own model, you will need to ensure it's exported as a 3D-printer friendly model format, either an STL or an OBJ file (all the printers we've featured support these formats). But there's one last thing you need to do.

Because 3D printers work in different ways, and have their own idiosyncrasies, you need to convert your OBJ or STL file via an app called a "slicer" (many printers come with their own slicing software, such as Ultimaker's Cura). What this does, and the clue's in the name, is take your model, and – based on the parameters set – create a file that transforms your model into a series of layers. This is called G-code. And G-code makes the magic happen.

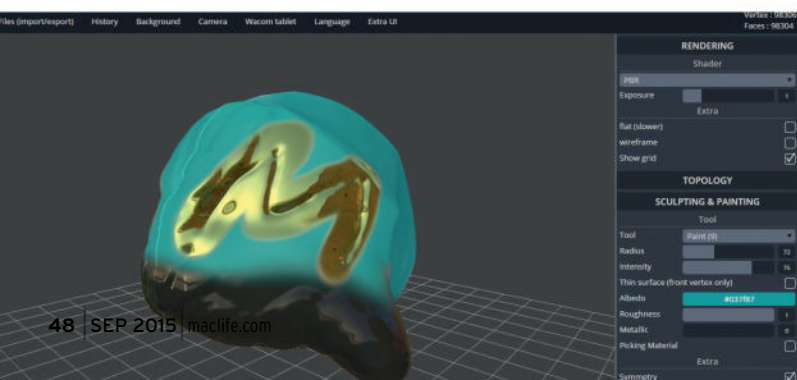
### UNDERSTANDING FILE TYPES

One of the things that confuses many people about 3D printing is file formats. With no one-size-fits-all format, the question of what to use is one that every newcomer will ask. "Depending on the printed output type (single color, full color, plastic, resin, etc) there can be a preference for the model input format," explains Richard Curtis, principal solutions consultant at Adobe. "If it's a single color, it's most likely an STL file, or for full color, it could be OBJ or VRML."

When creating a file you must be mindful that it's going to become a physical object,

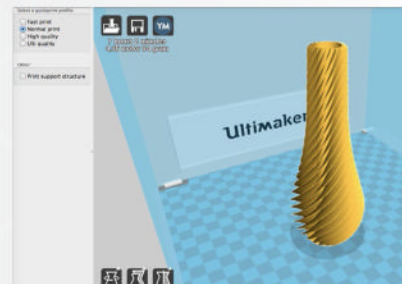
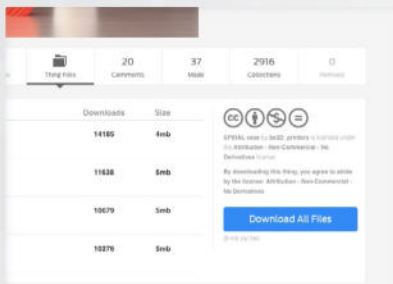
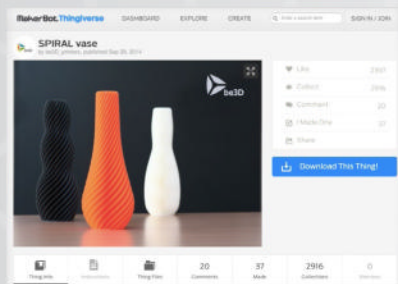
governed by its geometry. If you create your own files, especially from scans, it's rarely a question of simply clicking "print."

"All 3D objects need to be prepared for printing – a process referred to as model fixing," Curtis says. "Model fixing is a quality inspection process, intended to ensure objects are water tight and the geometry is suitable. Preparations and corrections include repairing holes, removing floating polygons, correcting polygons facing the wrong way or simple tasks such as creating temporary printing supports for over-hanging elements."



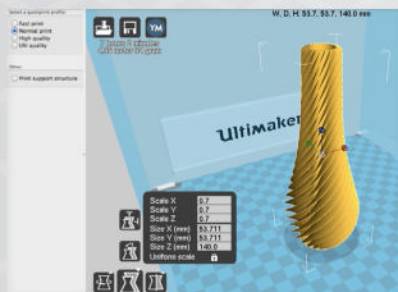
# MAKING A 3D PRINT

Here we show you how to print your first 3D model



## 1 FIND A MODEL

Here we're using the Ultimaker 2, which is a great machine for newcomers. However, despite Ultimaker's own model repository, YouMagine.com, being a great place to find free models, MakerBot's Thingiverse.com has a much broader selection. We've chosen this slim vase ([thingiverse.com/thing:481259](http://thingiverse.com/thing:481259)), and we'll be printing it using colorFabb's fluorescent green filament ([colorfabb.com/fluorescent-green](http://colorfabb.com/fluorescent-green)).

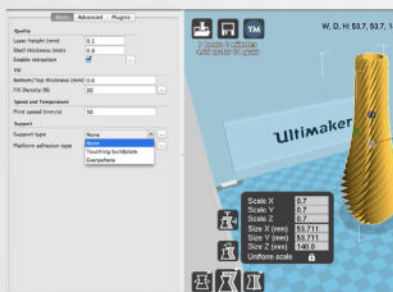


## 4 CHECK SCALE

The first thing we're going to do is reduce the scale of the vase a little. An 11-hour print is a bit much for our first foray into the world of 3D printing, so we're going to scale things down to 70% (though this still results in a seven-hour print!). To do this, you first click on your model, and then select the Scale icon at the bottom of the Cura interface. In the window that pops up you need to type "0.7" in the X, Y and Z scale options.

## 2 DOWNLOAD THE FILE

To download 3D files on the Thingiverse website you need to first click the icon titled Thing Files, that sits on each model page, and then select Download All Files. Once you've got your files stored on your Mac, you need to open your slicer software (for us it'll be Ultimaker's Cura app) and open the STL file you downloaded from Thingiverse. Typically, 3D print files are actually quite small – just a few megabytes.

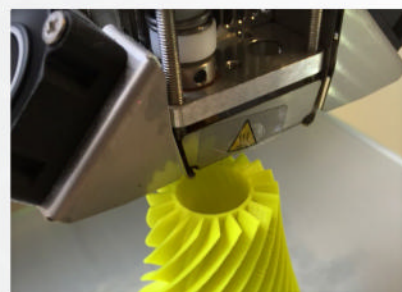


## 5 FINE-TUNE SETTINGS

Now let's jump into expert view, by selecting Expert > Switch to full settings from the menu. You'll now see more settings on the left-hand side of the window. At the top, under Quality, is "Layer height," which is the most important setting to know (as it determines the overall quality of your print). The Ultimaker 2 can print from 0.06mm to 0.25mm, but, generally speaking, 0.1mm is fine for most prints.

## 3 OPEN YOUR STL FILE

Now you need to open your STL file in your slicer app (as mentioned, we're using Cura). You will see your model, rendered virtually, within a three dimensional canvas. You can zoom in on your model, change scale, or pan round to check detail. Our default view enables us to choose pre-selected settings for four quality levels. Notice that you'll get an accurate time for printing the model at the top of Cura interface.



## 6 SAVE AND PRINT

You can leave other settings as the defaults (though experimenting is part of the fun), but make sure "support type" is set to "Touching buildplate" (this means you'll get a 3D print version of scaffolding around your model, for areas that overhang). Once done, go to File > Save GCode and – for use in an Ultimaker – save it to an SD card, which you insert into your printer. Depending on the object it can take several hours to complete.



## AFFORDABLE 3D PRINTERS

It's worth investing in the best 3D printer in your budget



### MAKERBOT REPLICATOR MINI

**\$1,375**

**Manufacturer** MakerBot, [makerbot.com](http://makerbot.com)

**Requires** OS X 10.7 or later

The full-size Replicator costs \$2,789, so the Mini is far more affordable option if you're after a MakerBot.

#### > THE MAKERBOT

Replicator Mini has plenty to attract newcomers. First up, it looks the part, and there's an onboard camera, so you can remotely check your prints (though it's fairly low resolution). And you can even send files to

your printer via Wi-Fi. However, specs aren't up there with some other printers, with a 200 micron layer resolution, and a smaller print area of 100x100x120mm. The MakerBot Desktop tool and Thingiverse.com are easy to use, though.



### WITBOX

**\$1,999**

**Manufacturer** bq, [bq.com](http://bq.com)

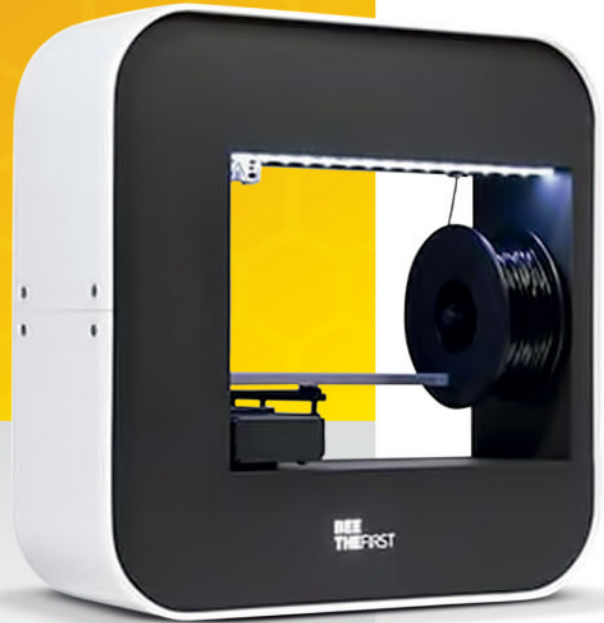
**Requires** Cura software fully compatible with OS X

If you're looking for a printer that has great features and won't break the bank, this could be it.

#### > COMPARED TO THE

Ultimaker and (full-size) Replicator this a cheaper printer, but you wouldn't think so to look at the specs. With layers of up to 50 microns, a print area of 210x297x200mm, and a fully enclosed design featuring an interlocking

door, it's hard not to be impressed. Rather than use its own custom software, the Witbox is fully compatible with Ultimaker Cura app, and bq recommends Cura. It also has a filament feed pipe built into the printer, unlike the Ultimaker 2.



## ULTIMAKER 2

**\$2,499**

**Manufacturer** Ultimaker, [ultimaker.com](http://ultimaker.com)

**Requires** Cura software fully compatible with OS X

The Ultimaker 2 is recommended for anyone that's happy to pay a bit more for a home 3D printer.

**> DESPITE SITTING AT** the more expensive end of the market, the Ultimaker 2 has won numerous plaudits since its release in 2013. It has a 20 micron layer resolution, can print at speeds from 30mm/s to 300mm/s, and has a print

area of 223x223x205mm. The Ultimaker 2 also has a fantastic companion app in Cura, which is one of the easiest-to-use 3D slicer apps available. Calibrating is simple, and prints are stored on and read from a removable SD card.

## BEE THE FIRST

**\$1,699**

**Manufacturer** BEEVERYCREATIVE, [beeverycreative.com](http://beeverycreative.com)

**Requires** OS X 10.8 or later

If you're looking for a 3D printer with a bit more style, the BEE THE FIRST could be the one for you.

**> WE'RE NOT SURE** how the name for this printer came about, but from an aesthetic perspective, there's a lot to like. Sleek, streamlined, and portable, this is a printer that could fit into an office space without standing out. However, to

achieve this, the printer uses proprietary, smaller spools, and has a print area of 190x135x125mm. Like the Witbox, you're looking at layers up to 50 microns, and you get custom-developed software called BEESOFT to slice and edit prints.

## MAINTAINING YOUR PRINTER

3D printers require some light maintenance to operate at their best - here are the pro tips to ensure longevity

**A**ll 3D printers will have their own guides for keeping them well maintained, but there are certain upkeep tips that ring true with most of the home 3D printers you can buy today.

First up, and possibly the most important tip of all, is to ensure that you use quality filament in your 3D printer, and ensure it's the right diameter for your machine. If you put sub-standard filament

in your machine, you're going to experience a number of problems. You'll see uneven prints, poor surface finish and quality, and in the worst case scenarios your printer will get damaged. So ensure you read product reviews before you buy, and try to establish where the filament you're buying originates.

"There are many different standards in terms of quality for both 3D printers as well as the materials" explains Sander

### IS THIS STUFF LEGAL?

It's hard to know where to start with copyright infringement and legal ramifications... Whether it's infringing on a rights holder's image, copying another person's model, or mashing up existing work, it's easy to see examples on the leading model repositories.

Anyone with a claim can send a takedown notice to the likes of Thingiverse et al, which will be acted on (and it's these sites, and their users, that are likely to be liable, rather than the printer makers). Most online communities police themselves, though, and attribution is often enough to satisfy a fellow model maker.

And as for major rights holders? Well, judging by all the *Star Wars* models around, there seems to be a watching brief... But that could change at a moment's notice.







### STORMTROOPER HELMET

You may have heard that there's a new *Star Wars* movie coming out, and there's renewed interest in Lucas' franchise (if your interest ever went). You may be surprised at what you can find online to print, like this brilliant Stormtrooper helmet. [thingiverse.com/thing:362947](http://thingiverse.com/thing:362947)

Strijbos, from leading filament provider colorFabb. "All printers treat different materials differently, so there is a learning curve to be made by the user when starting to print."

### FILAMENT FUNDAMENTALS

Once you have the right filament you must ensure your printer is correctly calibrated. Because 3D printers use heads, which are precision controlled through three axes, a small misalignment can cause poor results and printing errors. You'll often spot the result of a problem around the printhead, but the issue is more likely to lie elsewhere, such as misalignment or a feed jam.

As most 3D printers use a metal axes, it's good to keep them lubricated, though how you do this may vary depending on each machine. As a rule of thumb, though, you can apply a drop or two of sewing machine oil to the x axis and y axis every week or two. The z axis, which raises and lowers your print bed, may require a lube rather than an oil, so make sure you're

## A SMALL MISALIGNMENT IN THE HEADS CAN CAUSE POOR RESULTS AND PRINTING ERRORS

using the right lubricant for the job. And check belt tensions periodically, too.

The last thing to consider is your build plate. This is the platform that your printer lays plastic onto, and to ensure adhesion – and in some cases to prevent warping – some printer manufacturers will suggest putting a thin layer of craft glue on your plate before printing. If you do this, you should give your plate a clean when you start to notice a glue build up, or when prints start to suffer as a result.

## WHAT'S NEXT IN 3D PRINTING?

From human body parts to edible sugar work, 3D printing is only just beginning to fulfil its potential

### "EVENTUALLY 3D PRINTING

will print people. I'm not saying I agree with it, I'm just saying what's fact based on plausible growth in technology," music artist Will.i.am recently said in an interview. "If you can print a liver or a kidney, god dang it, you're going to be able to print a whole freaking person."

3D printing has captured the public's imagination. And the breadth of applications make it such a fascinating topic.

"Lives can be saved or made easier with the help of 3D printing," says Andreas Langfeld, general manager at MakerBot Europe. "This always fascinates me. In the end, it all depends on the variety of materials that can be used. The more materials or composites available, the more use cases are possible. I can easily see my dentist 3D printing my inlay or filling in the near future."

The applications of 3D printing

seem boundless, whether it's catering to the food industry via the ChefJet (a high-end 3D printer for crafting creative sugar work from 3D Systems), or helping the movie props industry. And via new tech, such as HP's Multi Jet Fusion Technology, print times are set to be slashed. But the possibility of working with more than one material, and new materials, excites many. "At the moment, the vast

majority of 3D printers work with plastic, which has its limitations," RepRap's Adrian Bowyer tells us. "People are adding electrical conductors, which means printable electronics embedded in plastic mechanics. Other materials like elastomers (for flexible items, like shoes and clothing) and ceramics (very high temperatures for things like metal casting) are also coming. Soon we will have machines that can work with half-a-dozen materials with radically different physical properties in a single print. This will mean a steep rise in the complexity, usefulness and value of what can be 3D-printed."



# APP LIFE

THIS MONTH'S MOST INTERESTING IPHONE & IPAD APPS

## Nimbus Note

A better iOS note service than Evernote?

**FREE** Developer Nimbus Web, [nimbus.everhelper.me](http://nimbus.everhelper.me)

**Platform** iPhone, iPod touch **Requirements** iOS 7 or later



Launched weeks before the App Store in 2008, Evernote is widely considered the 800-pound gorilla when it comes to taking notes on mobile devices, and with good reason: it's full-featured, easy to use, and reasonably priced. But there are plenty of rival services now looking to dethrone the king.

Nimbus Note is one such contender and a relative newcomer to the iOS platform. Each service is evenly matched in terms of core note-taking capabilities, including offline access, the ability to add

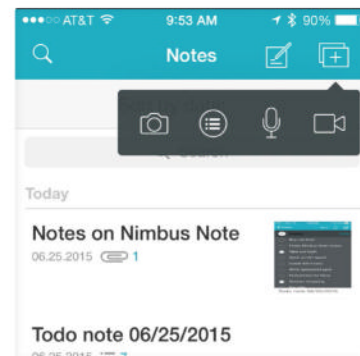
reminders, photos and audio, tag notes, or organize content into folders. Nimbus eschews some of the more questionable additions to Evernote's feature lineup (business card scanning and presentation mode, for example), sticking much closer to the basics – but with a few unique tricks up its sleeve as well.

Video recorded directly from the built-in device camera

can be added as attachments to any note. To-do lists are also more eye-pleasing, and appear as a separate pop-up menu instead of the main note body. There's even support for handwriting, which Evernote currently limits to Android and its Penultimate app for iPad.

Unfortunately, Nimbus Note leaves a few things out of the equation – most notably, a native OS X client (Mac owners must use a web app instead) and the ability to clip from websites on iPhone, a feature curiously found on the separate iPad version and desktop extensions for Chrome or Firefox. Worse yet, the smartphone app still hasn't been updated for iPhone 6 displays, making for a rather cramped experience when typing.

Nimbus is also a bit behind the times when it comes to pricing: Pro users are limited to 1TB of uploads per month, which doesn't look like such a bargain now that Evernote Premium offers unlimited for the same price. To be fair, free users get a little better deal with Nimbus (100MB per month versus Evernote's 60MB), which is enough for casual users who



Nimbus Note offers clever tricks such as video attachments from the iPhone.

don't upload a lot of video or large attachments.

Nimbus generally offers a purer note-taking experience, although we're not ready to jump ship from Evernote quite yet. For those contemplating such a move, the Windows client can directly import Evernote databases with notes, images, folders, and tags intact, but creation dates aren't preserved and you'll have to manually re-add PDF files.

**THE BOTTOM LINE.** A more focused alternative to Evernote, but the lack of a proper Mac client and iPhone 6 support mean it's only second best.

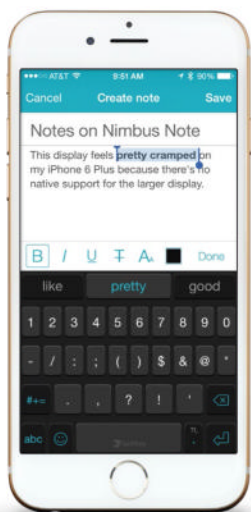
**J.R. BOOKWALTER**

### NIMBUS NOTE

- Clean, focused note-taking with cloud sync
- Better to-do lists; video attachments
- No native iPhone 6 display support
- No Mac client (web only)

**GOOD** ■■■■■

If you have an iPhone 6, writing notes is going to feel rather confined on Nimbus Note.



# Moleskine Timepage

Brings a touch of Moleskine's elegance to iOS

**\$4.99** Developer Moleskine

**Platform** iPhone, iPod touch **Requirements** iOS 8 or later

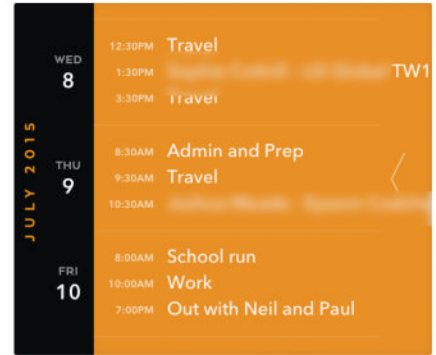


Moleskine may not be able to claim Timepage is inspired by something used by Van Gogh, Picasso, Hemingway and Chatwin, as it does with the notebooks with which it made its name, but the influence of those notebooks is very visible in the app. Timepage is a calendar app, but just as those notebooks are more than just notebooks, so this is more than a place to record meetings and set reminders.

The key to Timepage, and the feature that gives it its name, is the single scrolling window that acts as your diary. There's no week or month view here, just an endless stream of days, marked with the date and

with the month and year stamped vertically alongside. Swipe up and down over the days to move between them, or swipe over the month to move a month at a time. Tap on a day to see it in detail and tap again to add an entry. Handily, the day view also displays a weather forecast for that day. Tap and hold on the weather preview and it displays an hourly chart with predicted rainfall.

You can add your Google, Exchange, and iCloud calendars, and choose which calendars from each to display. When you type a name in an event, Timepage suggests people with that name from your Contacts – though it didn't always find the contact we wanted.



Your life on the (time)line... this calendar puts your events in one flowing, easy-to-view list.

While you can set appointments to repeat, there's no "every weekday" option. A Watch app allows you to see each day at a glance, and tap to see more detail on appointments, locations, and the weather.

**THE BOTTOM LINE.** Beautiful to look at, easy to use, and with a novel interface.

**KENNY HEMPHILL**

**EXCELLENT** ■■■■■

## Line2

**FREE (subscription required)** Developer Line2 Inc, line2.com

**Platform** Universal **Requirements** iOS 7 or later



Services such as Google Voice make it easy for anyone to have a free phone number to maintain privacy or run a small business from home without a second line. Line2 works similarly, but uses a wireless data connection (instead of your carrier minutes) for calls and texts.

The free version is unlimited in the US and Canada, but only to toll-free numbers or other Line2 users – if you want to call landline or cell phones, you'll need to buy the \$9.99 per month subscription, which adds call forwarding, screening, and

group calls with up to 20 people. (Free users also have ads on most screens.)

Call quality is good even over cellular data connections, and push notifications alert users to incoming calls, texts, or voicemails. The app is fairly minimalist, and Apple Watch support puts the same information on your wrist, along with the ability to voice-dictate text replies.

**THE BOTTOM LINE.** Line2 delivers quality VoIP, but at a price much higher than Google Voice. **J.R BOOKWALTER**

**SOLID** ■■■■

## Shoot by ProCam

**99¢** Developer Samer Azzam, procamapp.com

**Platform** iPhone, iPod touch **Requirements** iOS 7 or later



Camera apps aimed at pros are common these days, offering manual control over elements such as focus, exposure and shutter speed on your iPhone camera to give more control over your shots.

Shoot is one such app, and does its job very well, but also has some features you see less often: it can take pictures as lossless TIFF images, and when you manually focus, you get a magnified view, such as many dedicated cameras offer. That's about it – it's just a lightweight camera app – but that's

potentially enough. It's really easy to make shooting tweaks, the focus magnification is great, and TIFF images do look superior (though they take up much more space). However, Camera+ does all of this except the focus magnification, and has excellent editing features for just a couple of extra bucks. If you want the magnification and don't want the editing options, this is a very good app.

**THE BOTTOM LINE.** A great shooting app, but we'd still recommend Camera+ for most people. **MATT BOLTON**

**GREAT** ■■■■






Vee may seem a little feature-light for some but for quick editing on iOS, it makes movie creation a cinch.

# Vee for Video

A fast movie editor for the sharing age

**\$1.99 Developer** Medious, [veeforvideo.com](http://veeforvideo.com)

**Platform** Universal **Requirements** iOS 8 or later

 This video-creation app aims to bring filming and editing closer together than something like iMovie, so you can produce slick movies almost in real-time. When you're in a project you've made, the timeline for recorded clips is at the bottom, and the screen above is dedicated to a live view from the camera – just hit the orange

button to start recording. When you stop, the clip is instantly added to the timeline. You can also import clips from the Photos app you've recorded previously. When you tap a clip on the timeline, the main viewer switches from showing the camera feed to that clip, with a range of options at the bottom. You can change the speed, choose from a range of filters, or trim the clip. You can't split a clip, though, which seems an obvious omission to us. You can rearrange clips by just tapping and holding to drag. It's all really easy, with a very smart, friendly and clear interface.

It actually has a few tricks up its sleeve for recording, including live filters and stabilization for hand-held shooting, but best of all is the Ghost option, which shows a faint image of the final frame of the last clip over the





recording screen, so you can start your next shot in a way that matches it. It's a little thing, but if you're trying to make something quick while keeping your cuts smooth, it's a great addition. And, usefully, you can set the exposure and focus for different areas in the frame.

If the app has a specific weak spot, it's audio. You can add music from what's stored on your device, and choose the sound level balance between the music and your clips, but that's it. There aren't any sound effects or shorter audio clips for texture, and you can't tweak the audio of individual clips.

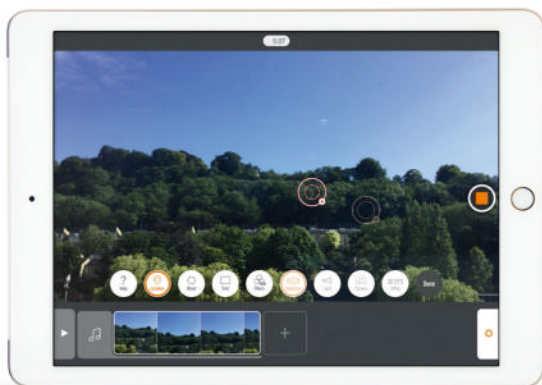
It's also missing a bunch of features for general flexibility, including titles, or cropping for something like Vine. (You export videos through the iOS Share option, so sharing videos to online services is fast and easy, or you can just save them to Photos.) But the point of Vee is that it's streamlined, so we understand why something like titles has been left out.

**THE BOTTOM LINE.** We like Vee a lot. It's very friendly, very fast, and has some extremely clever moments. It's limited as a video editor, but that's okay. For making polished videos quickly, it's great. **MATT BOLTON**

## VEE FOR VIDEO

-  Rapid recording and editing
-  Some clever recording features
-  Very easy to use
-  Some missing features

**GREAT** 



# Spare Lens

Easy effects and editing for short-form video

**\$1.99 Developer** Spare Lens, sparelensapp.com

**Platform** Universal **Requirements** iOS 8 or later

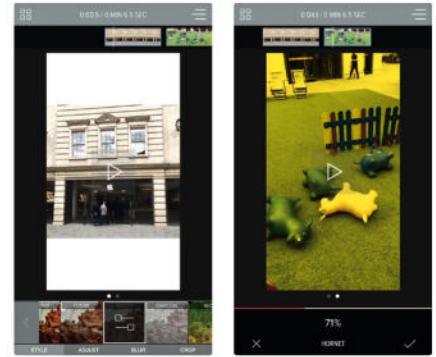


Spare Lens takes aim firmly at the Vine and Instagram video generation. You can record video (and easily control at what resolution and framerate, including cinema 24fps), with a clear timer letting you know how long you've recorded. You can stop filming, then instantly pick up again in the same video, and easily trash the last section you recorded to try again.

When you're happy, you get to the editing screen, with a timeline at the top you can scrub the playhead through, and you just press and hold to split a clip in two. That's pretty much the extent of editing in the traditional sense, though – you can't

rearrange clips you've split or delete them. At the bottom is a range of effects and filters, of varying usefulness in practise, the heaviness of which can be adjusted. Some are great, many less so, but they are all adjustable in how strongly they're applied, which helps. We had high hopes the blurring options would add some good fake depth of field to our videos, but we were never really happy with the results. Filters and effects can be applied individually to clips, at least, so you can get reasonably creative with cuts. You can then save videos to Photos or use iOS's Share tool.

This all makes it pretty good, if not quite blowing us away, but it does suffer from an



You can adjust the intensity of all the effects and filters, refining your video's look.

unclear interface at times, especially in the filters and effects menus on iPhone, which are profoundly confusing. It also has a few obvious omissions, such as a square overlay for framing when recording.

**THE BOTTOM LINE.** A video app with some great ideas and useful options, but some key stumbles too. **MATT BOLTON**

**GOOD** ■■■■■■

# Korg iM1

The popular synth gets squeezed into your iPad

**\$29.99 Developer** Korg, korg.com

**Platform** iPad **Requirements** iOS 8 or later



As one of the best-selling synths of all time, Korg's M1 has cemented itself a place in music history. The iconic hardware was used by the likes of Depeche Mode, The KLF, and 808 State, its then-revolutionary digital sampling and sound layering enabling rich and diverse audio.

It was, however, a massive pain to program, and so this iPad version should be considered a big improvement. Rather than a fiddly little screen above a huge row of piano keys, iM1 has you let rip on built-in sounds, tweaking them to perfection using your iPad's generous touchscreen. Output appears faithful to the original hardware,

and layering's intact – up to eight sounds can be combined in Combo mode. There's plenty of potential for live performances with two alternate keyboards and Kaoss pads, while Audiobus and Inter-App Audio help in the studio. Elsewhere, Gadget users get the Darwin synth – a cut-down iM1 that's no good for sound editing but nonetheless brings across your presets.

And there are loads of presets – 3,300 of them across 34 virtual ROM cards. Unfortunately, the majority are bundled as two \$4.99 IAPs, which seems a mis-step for a premium synth. Our only other criticism is these sounds are very much of their time. Still, if you're a fan and like tinkering with



There's nothing 80s about this iOS synth. Well, there is, but it's got cutting-edge iPad style now.

virtual synths, iM1 is another impressive release from Korg that will provide hours of joy, whether you're a musician who rocks stadiums or merely your living room.

**THE BOTTOM LINE.** The sounds may be an acquired taste, but if you've even passing interest in the M1, this is a superb app.

**CRAIG GRANNELL**

**GREAT** ■■■■■■



In a few hours of play, you'll think you know this woman so well – until a new video changes your perspective again.

# Her Story

Finally, a detective game worth investigating

**\$4.99** Developer Sam Barlow, herstorygame.com

**Platform** Universal **Requirements** iOS 7 or later



Games have always struggled with the idea of making you a detective. The kind of rigid systems that games need just can't satisfy the complexity of our curiosity. There'll be questions you want to ask or places you want to visit that the game just doesn't allow.

Her Story is a detective game that brilliantly sidesteps games'

accidental restrictions by giving you intentional ones instead. In it, you are sifting through a 20-year-old computer archive, reviewing police interview tapes. They're all of the same woman, taken over several days after the disappearance of her husband. They're split into small chunks – and there are over 200 of them. The problem is that you can't watch them chronologically. Instead, you can search them for certain words – each has been transcribed, so if the woman mentions the word you search for in a video, it will be returned. Only five can be returned at once, though, so looking for obvious results will only get you so far.

You need to watch the tapes you do find, then decide what hints you've picked up on to search for next: a new name or place might reveal new videos, giving you further names to try.

The restrictive genius, then, is that this investigation already happened – cleared up long ago, though you as a player don't know how it ended – and when you know the system you're working in is limited, you stop being frustrated by it and start figuring out how to get creative in it. And best of all, this makes your game unique to you. The story has many secrets to reveal, but how you reach them, and when, depends on which threads you pull. Some revelations are big twists if you haven't seen the videos that provide the background, but are no surprise if you have – everyone gets a different "Aha!" moment. This lets you feel smart in a way few other games have ever managed – it doesn't feel like solving a puzzle, but genuinely more like uncovering the truth.

It's a great story to delve into too, with an intriguing performance from its lone cast member – at times suspicious, at times sympathetic. As you pick apart the contradictions and hints, spinning theories, you'll feel like you're unleashing your inner Richard Castle.

**THE BOTTOM LINE.** An engrossing, exciting, unique mystery experience. A true essential. **MATT BOLTON**

## HER STORY

- Great investigation that's unique to you
- Clever layered story
- Good central performance
- Also available on Mac!

**AWESOME** ■■■■■

**MacLife**  
EDITORS' CHOICE





# Xenowerk

All werk and no play holds this polished shooter back

**\$1.99** Developer Pixelbite, pixelbite.se

**Platform** Universal **Requirements** iOS 6.1 or later



This twin-stick shooter turns you into an unstoppable alien-killing machine, blasting nasty green things across 50 levels set in military or industrial complexes. There's nothing especially new here – kill aliens, use money from killing aliens to buy bigger guns, kill bigger aliens with your bigger guns – but that shooting core has been polished to an impressive level of shine. You take two guns with you on every level, with a choice between things like assault rifles, shotguns and grenade launchers, with good variety in how they work – but all are supremely satisfying. Enemies stagger in the hail from a nice

assault rifle, and pop into splatters of lovely green goo. Every hit is registered with a little number indicating the amount of damage you do, and seeing these numbers ring up rapidly from an explosion or bullet swarm is glorious. You get bonuses for chaining kills within a certain time limit too – encouraging you to always be aggressive (and there are no ammo limits too, though guns can overheat).

The thing is, while *what* you do in it is awesome fun, *how* you do it is much less interesting. The 50 levels are all built from the same fairly few modules, so they feel quite repetitive. New modules appear as you get deeper, but still lack variety. And



Warning: you may involuntarily yell “HAHAHA, DIE ALIEN SCUM!” when playing Xenowerk.

this is true of both the aliens you fight and the objectives on each level too. It's extremely pretty (though performance stutters even on an iPad Air 2 when it gets really busy), but it just needs more depth.

**THE BOTTOM LINE.** Great shooting action, but just feels a bit too repetitive as it goes on. **MATT BOLTON**

**GOOD** ■■■■■

# Fallout Shelter

Resource management goes underground

**FREE** Developer Bethesda Softworks, bethsoft.com

**Platform** Universal **Requirements** iOS 7 or later



There's not enough clean water to drink in Vault 101; power isn't being produced fast enough to maintain the purification process. Thanks to infestations, half the vault's inhabitants have radiation sickness. Dweller happiness is less than 20%. Things are bleak. Yet, underground, Emily and George are flirting. They disappear for some privacy... Life, despite the ticking Geiger counter, finds a way.

That snapshot sums up Fallout Shelter: no matter how desperate things seem, you want to – have to – keep going in the hope that things will turn around. And they do. You are the Overseer of a nuclear bunker,

and you need to manage its need for power, radiation-free water and food. Oh, and living quarters to keep your population growing – children grow up into new workers, after all. Each dweller has a set of stats, which determine their suitability to man the various rooms and plants you build. Match them to a suitable station, and they're both happier and more productive.

So far, so Tiny Tower, but once you've established a basic equilibrium, there are training rooms to increase stats, radio stations to lure in new people, and you can send suitably equipped explorers outside to comb for supplies. They might return with weapons and special outfits – handy in the



Benjamin could be happier. It's your job to keep your workers happy – and productive. Get to it!

event of invasions or the “incidents” that can happen when you attempt to rush production. Like your vault itself, this is intricate, occasionally tense and surprisingly deep.

**THE BOTTOM LINE.** A satisfying experience of running an entire colony of tiny people. **EMMA DAVIES**

**GREAT** ■■■■■



Who would have guessed that humanity's future space adventures would be so adorable?

# Tales from Deep Space

In space, no one can hear you teamwork

**\$6.99** Developer Frontier Developments, [games.amazon.com](http://games.amazon.com)

**Platform** Universal

**Requirements** iOS 7 or later, iPhone 5s/iPad Air/iPad mini 2 or later



There's trouble afoot on the Big Moon space station, and you're at the heart of it. Except, rather than being some gritty, charming Han Solo type, you're adorably pudgy astronaut E, who's haplessly stumbled into trouble simply by being robbed and having had dilapidated droid companion

CASI thrust in his direction. In contrast to developer Frontier's huge, deep space sim *Elite: Dangerous* (reviewed last issue), this is a cheery, colorful caper that revolves around platforming and puzzling, as well as the odd brief combat encounter with the evil Red Meek army.

You take control of both E and CASI, dragging across the screen to move and switching between the two at a tap of a button. You can order one to follow the other, or to stay put while you take their companion off on an alternate route, to activate a switch for example. The two have slightly different abilities – E can scramble between platforms and pop through vents, while CASI can boost-hover up to higher areas and traverse certain electrical fields – and combining them is key to much of the

game's environmental puzzling. A typical objective tasks you with finding a route from point A to point B, and to get there you'll need to repeatedly split your duo up for short periods, using CASI to hit switches that send E up on an elevator platform, say, before floating CASI up to join him.

Your goals split the play up into manageably small chunks, but thankfully don't feel too hand-holdy – you might be told where to go, but it's up to you to work out how to get there. On the other hand, you do feel more like you're following a series of (enjoyable) instructions than living a grand, overarching narrative. As such, it's down to the gameplay itself to keep you compelled, which it manages through a steady feed of new tricks such as item-levitating grav rings and extra enemy types to fight. Combat is mostly simple – E has a raygun and CASI a mean punch, both activated by tapping in the desired direction – but the addition of enemies that can only be attacked from the back, and so on, adds a little extra strategy.

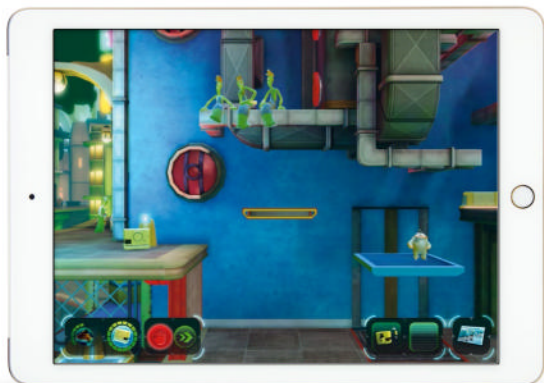
**THE BOTTOM LINE.** This is great-looking, light, entertaining gaming that's definitely worth a look.

**EMMA DAVIES**

## TALES FROM DEEP SPACE

- Character-switching is instantaneous
- New gameplay additions keep you hooked
- Drag controls are occasionally imprecise
- Overall storyline isn't especially compelling

**GOOD** ■■■■■



## ROUNDUP

# The 6 best iPad apps for better music making

Go beyond GarageBand with these amazing apps for recording songs

BY DAVID BIEDNY

The iPad has gained a reputation as a very capable and powerful music-creation tool. GarageBand is a great place to start, but taking the next step can be difficult when faced with an overwhelming number of creative options. Don't worry: we'll point you toward the very best beat-making apps out there.

There are some basic apps you'll need in order to use your iPad as a pro-level recording and music tool, starting with your main DAW (Digital Audio Workstation) software.

**CUBASIS** (\$49.99, iPad) is the most powerful, full-featured iOS DAW platform. It boasts an extensive set of MIDI recording and editing tools, integrated sampled audio tracks, a nice set of basic audio-processing tools, and total support for external synths and effects via Apple's Inter-App Audio framework – for passing sound between apps – as well as Audiobus, a third-party system to do the same. The automation potential of all key



The Cubasis multi-touch sequencer is a great choice for recording, editing and mixing.



Korg Gadget offers mixing and sequencing using an array of synth and drum Gadgets.

parameters sets this program apart, and is a key aspect of the professional pedigree of the app.

**KORG GADGET** (\$39.99, iPad) is a fully featured synth recording studio with tons of built-in synths. It doesn't directly support a dedicated sampled-audio track, but it offers workarounds by loading sampled sounds via its sampler instruments.

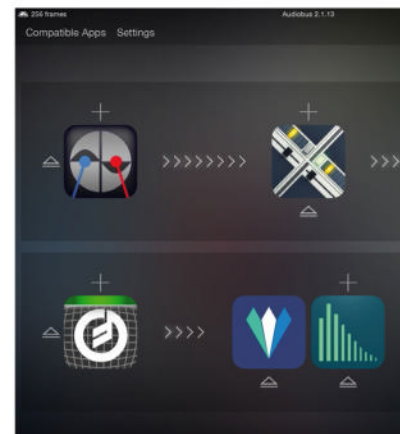
There are so many iOS synths and drum machines that sorting through them all can be a headache, but **THUMBJAM** (\$8.99, Universal) stands out. The app offers realistic, real-world instruments with extreme playability, an extensive set of included sounds, really cool accelerometer support (tilting your iPad adds realistic note bends to the electric guitar patch), a vast library of predefined musical scales (ensuring that you'll only play a wrong note if you want to), and much more.

On to the newest straight synthesizer on the block.

**SYNTHMASTER PLAYER** (Free with IAPs, iPad) offers 100 patches right out of the gate, with plenty more aural options available via In-App Purchases. It's a no-brainer for electronic music, with loads of really useful sounds.

For laying down percussion, it's hard to beat the **DM1** (\$4.99, iPad) drum machine app. It has an exceedingly straightforward interface, a long list of sound options, and an excellent selection of integrated effects. It's really easy to get some cool beats going within moments of opening the app for the first time.

**AUDIOBUS** (\$4.99, Universal) is the glue that connects most important iOS music apps, providing a realtime pipeline between them. It lets you use synthesizers, drum machines, effects, processors, and recording software together in a logical, powerful production chain. Audiobus will tax the RAM and CPU of even the most powerful iPad.



Audiobus supports over 600 music apps, linking them together in perfect harmony!





# REVIEWS

TOUGH TESTING, TRUSTED RATINGS

## LG 65EC9700

One giant leap for TV image quality

**\$8,999** Manufacturer LG, lg.com**Key features** 65-inch screen, 4K Ultra HD, 3D, OLED, webOS smart TV system

The LG 65EC9700 is potentially one of the biggest things to happen to television since the arrival of HD. Like plasma technology, and unlike LCD, OLED is a self-emissive technology. Each and every pixel in its native 4K UHD resolution can produce its own individual light level and color, making for more detailed images than ever. This awesome tech comes in a lovely design too: the way its tiny frame and screen share the same single “plane” gives it a beautiful premium finish. The TV’s rear carries its connections, including four HDMI inputs (including support for 4K UHD feeds at up to 60fps), USB ports, and both Wi-Fi and Ethernet. These network options can be used for streaming multimedia from networked DLNA devices, or for accessing the online services that form part of LG’s webOS smart TV system. The 65EC9700 features potent motion processing, as well as passive 3D (with a generous six pairs of glasses provided), and a solid array of calibration features – which we found necessary to use to get the best images from it.

When it’s ready, this TV absolutely delivers on the 4K OLED picture quality promise. Its contrast performance in particular is just incredible. The deepest, richest black tones we’ve simply ever seen on a television work wonders on anything you watch – but especially films, with their relatively extreme contrast ranges. The blackness makes pictures look more natural and more color-rich, and OLED’s ability to combine almost complete blackness in one pixel with bright whites and colors in neighboring pixels means that pictures look gorgeously and expressively dynamic. It delivers excellent color performance overall, too, offering rich, vibrant tones without looking unnatural at all.

Native UHD content lives up to our hopes too: expect gloriously polished, detailed pictures that look pretty much like real life for the majority of the time.

There’s no longer so much as a hint of the individual pixels being used to create pictures. The sense of clarity is aided by its great handling of motion, too.

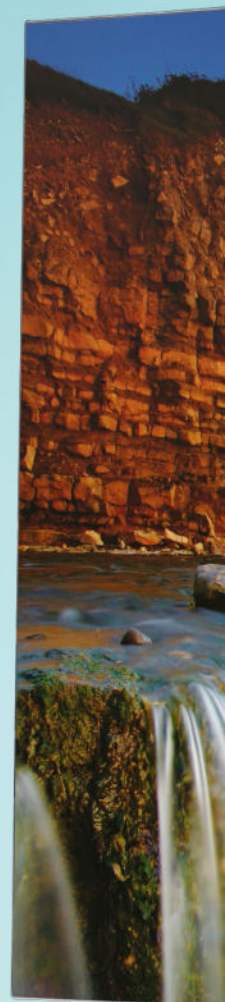
**THE BOTTOM LINE.** Thanks to its incredible contrast performance, native 4K UHD resolution and rich, natural colors, the 65EC9700 delivers, at times, the best pictures we’ve ever seen from a TV. **JOHN ARCHER**


**MacLife**  
EDITORS’  
CHOICE

### LG 65EC9700

- ✚ Jaw-dropping design
- ✚ Unprecedented contrast performance
- ✚ webOS works brilliantly
- ✚ Needs accurate setup

**AWESOME** ■■■■■



A curved Samsung monitor is shown from a low angle, displaying a vibrant coastal scene. The screen shows a rocky cliff on the left with a waterfall cascading down into the ocean. The sky is filled with dramatic, layered clouds in shades of blue and white. The monitor's bezel is dark, and the Samsung logo is visible at the bottom center. The background of the entire page is a solid light blue.

For detailed definitions of every score on Mac|Life's ratings scale, go to [maclife.com/ratings](http://maclife.com/ratings).

It's gorgeous. It's revolutionary.  
It's... really expensive. But  
worth it if you can afford it.



# Tweetbot for Twitter

It's better than ever – but still not quite perfect

**\$9.99** Developer Tapbots, tapbots.com

**Requirements** OS X 10.10 or later



Tweetbot for Twitter features a flatter, Yosemite-style interface.

Tweetbot is a Twitter app worth paying for, and this release is another reason why Twitter's official client remains absent from our Macs. For starters, you don't have to suffer through Twitter's incessant efforts to wedge advertising or other unwanted content into our timelines when using Tweetbot, but the ability to display multiple column views side-by-side and have more granular control over notifications also makes this a worthwhile investment.

Version 2.0 now fits in nicely alongside Apple's new OS X aesthetic, while finally catching up with other newer features introduced over the last year or so on the iPhone version. (There's still no sign of the promised iPad update, which is starting to buckle under the weight of recent Twitter changes.) This version also plays nice with the latest quoted tweet style, and is ready for longer Direct Messages once Twitter pulls the trigger.

Make no mistake: this is largely a cosmetic and interface update, but the fact it's free for

existing customers (and now cheaper for new buyers) mostly makes up for the absence of any hot new features. Avatars can now be displayed as circles or rounded squares with the option to display Twitter's familiar blue "verified" checkmark, while the entire application has adopted a flatter appearance with support for sharper Retina displays.

**The biggest "gotcha" remains Tweetbot's apparent indifference toward inline media content.**

Tweets with multiple photos are now supported, but there's no way to display them all at once, requiring a cumbersome "click, view, close" routine for each. There's also still no way to watch inline videos (including GIFs), which go to your default web browser instead.

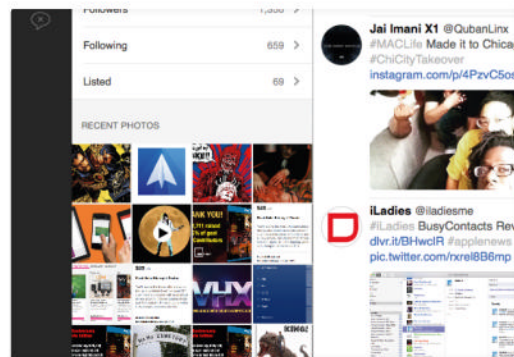
Another new feature that could use improvement is the grid of small icons which appears whenever a message is selected. These handy shortcuts for reply, retweet, favorite, and more practically require a magnifying glass to see on our 27-inch Thunderbolt Display, although the Share button is a welcome improvement for copying or emailing tweets, as well as saving linked articles to "read later" services (you can still right-click links, too).

**THE BOTTOM LINE.** Tweetbot delivers a long-awaited fresh coat of paint and feature parity with iPhone, but still comes up short for viewing inline media. **J.R. BOOKWALTER**

## TWEETBOT FOR TWITTER 2.0

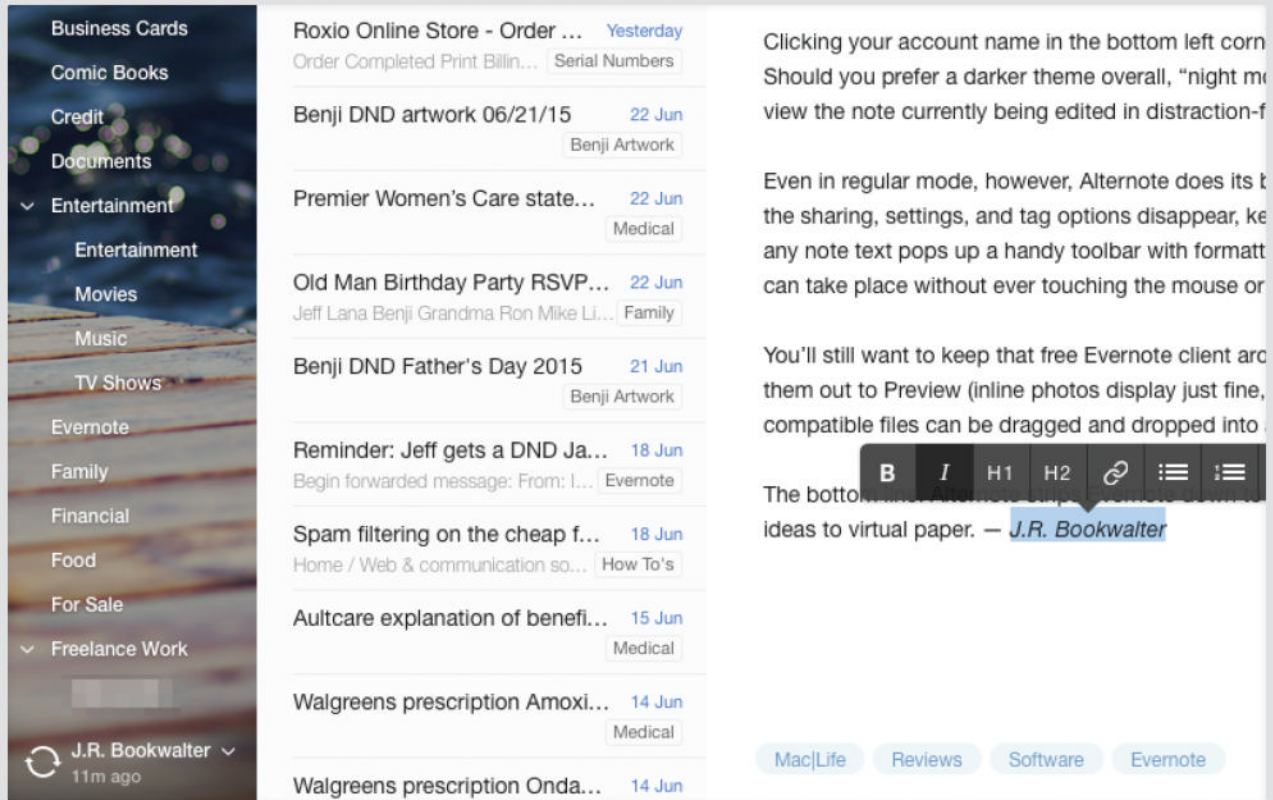
- Slick new Yosemite and Retina-ready look
- Maintains feature parity with iPhone version
- No "view all" option for multiple images
- No inline playback of videos or GIF files

**GREAT** ■■■■■



This version brings the excellent photos view from the iPhone version to OS X.





# Alternote

A stripped-down alternative client for Evernote

**\$6.99 Developer** MABee Arts, alternoteapp.com

**Requirements** Mac OS X 10.9 or later; 64-bit processor

As the name implies, this is an alternative to Evernote's "everything including the kitchen sink" app approach; an alternative which requires users to pay for the privilege.

Is it worth the money? For the most part, yes. We linked our account and within minutes synced nearly 600 entries directly from Evernote's servers (your stuff is never accessible by Alternote's creators). The application is quite responsive; users with more than 2,000 notes are recommended to selectively sync notebooks. The interface is familiar enough for Evernote veterans, with an optional sidebar displaying categories for All Notes, Starred, Notebooks, and Tags.

You can change the background color of the sidebar, and there's a "Night mode," along with the option to view the note

currently being edited in distraction-free mode. As you write, the sharing, settings, and tag options disappear. Text styling is entirely WYSIWYG; double-clicking pops up a handy toolbar with formatting options. There are also plenty of keyboard shortcuts.

Alternote can't display PDF files saved within notes, kicking them out to Preview for viewing (image files are displayed inline, however). There's also no import menu option, although compatible files can be dragged and dropped into an open note. Other features like shortcuts, shared notes, and business notebooks are currently missing, but promised with future updates.

**THE BOTTOM LINE.** A distraction-free environment for committing notes and ideas to virtual paper. **J.R. BOOKWALTER**

Double-clicking text in Alternote calls up a slick formatting pop-up with the most-used styling options.

## ALTERNOTE

- Compose Evernote notes without distractions
- Pop-up text styling menu
- Can't display inline PDF files
- No companion iOS app

**GREAT** ■■■■■

# Money Pro

Finally... finance software that syncs nicely with iOS

**\$29.99 Developer** iBear, ibearmoney.com

**Requirements** OS X 10.10 or later



The Today view offers a peek at that day's transactions.

Most legacy financial software remains chained to the desktop, but a new generation of sync-friendly applications clearly have mobile on their mind. With Money Pro, you can keep tabs on an unlimited number of accounts, budgets, and plan bill payments for personal or a small business. The Mac version is reasonably priced, while the inexpensive iOS companion app provides Apple Watch support for entering income or expenses from your wrist.

Getting started is simple: we exported recent transaction history from a Chase checking account in OFX format (an option supported by most banks) and quickly imported it into Money Pro; the application was smart enough to match data against categories we already had set up. Everything happens within a single window, while a grid of icons at left switch between Today, Balance, Budget, and Reports views.

Today provides a look at the current calendar month; clicking on any day shows a list of purchases or deposits made on that date.

Balance displays all payment accounts you've set up, alongside transactions for the selected period. From either view, clicking the + button in the upper right corner acts as a shortcut for adding new expenses, income, transfers between accounts, and more.

Money Pro doesn't miss a trick when it comes to entering data, with excellent support for split transactions, a description, check number, and even photos of an accompanying receipt, although this feature is handier when using the built-in camera on iPhone or iPad. There's an option to add payees (referred to as "agents") to a list of favorites – a cumbersome two-step process when entering names for the first time, because the software isn't smart enough to automatically select the new entry. (Note that there's no option for a one-time payee entry.)

Unlike most stodgy accounting software, Money Pro's user interface can be customized with themes, although we were unable to select them on Mac (and iOS themes require separate In-App Purchase). Accounts and categories can be spruced up, with more than 1,400 included icons and others created by users, making it easy to see at what money is being spent where.

**THE BOTTOM LINE.** Money Pro leaves few stones unturned when it comes to tracking, budgeting, and managing finances, but there's still room for further polish. **J.R. BOOKWALTER**

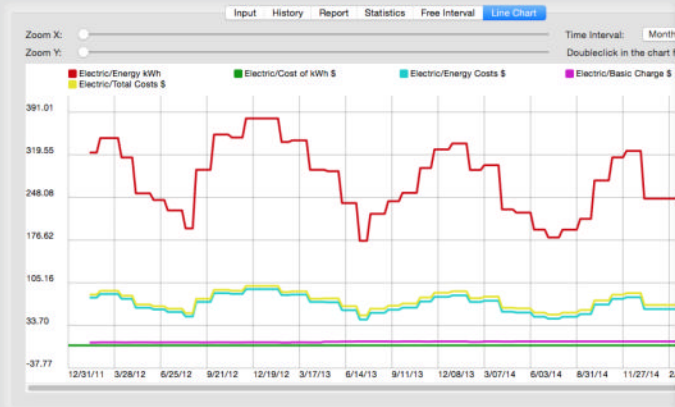


Money Pro also does a great job of keeping users on a budget, with multiple ways to view your finances.

## MONEY PRO

- ➕ iCloud sync with companion iOS app
- ➕ Import and reconcile bank statements
- ➖ Trailing zeroes truncated when displaying USD
- ➖ Mac themes can't be selected

**GOOD** ■■■■ ■



# Consumptions

Monitor your home utilities usage

**\$4.99 Developer** Matthias Rudolph, [forum.engerda-it.de](http://forum.engerda-it.de)

**Requirements** Mac OS X 10.10 or later, 64-bit processor

Consumptions paints a picture of how you use household utilities, displaying data across six different views (with History, Report, and Line Chart most useful) or exporting it. Nearly everything can be done from the main window, but we found the setup confusing. Lacking tutorials or tooltips, Consumptions offers little assistance aside from a barebones Help menu, so adding or editing meters using vague labels like “Meter Unit,” “Meter Factor,” and “Fraction Digits” becomes laborious. The process also takes more clicks than it should, with no support for copy and paste. Users are required to select meters twice before modifying them, although new readings entered from the Input tab can be done in a few clicks, tagged with the current date or one picked from the calendar.

The Mac version is a paid companion to the free iOS app, which allows meter readings to be entered via Apple Watch. While the mobile app features iCloud sync, Consumptions for Mac does not, requiring users to first save database files to iCloud Drive, then manually import to the desktop.

**THE BOTTOM LINE.** Consumptions for Mac offers a comprehensive view of meter readings, but is ultimately too complicated for average consumers. **J.R. BOOKWALTER**

## CONSUMPTIONS

- ➦ Comprehensive feature set for tracking utility consumption
- ➦ Variety of ways to view usage data; import/export of CSV files
- ➦ Setup too complicated for average consumers
- ➦ No iCloud sync with iOS version (iCloud Drive import only)

**WEAK** ■■■■

# Actuator

Email instructions to your Mac

**\$2.99 Developer** ACT Productions, [actproductions.net](http://actproductions.net)

**Requirements** OS X 10.8 or later, 64-bit processor

This clever application lets you trigger scripts to run on your Mac by sending an email. You can do similar already just by making a rule in Mail to trigger an AppleScript when criteria are met, but Actuator is smarter and more flexible *and* lets you trigger not just AppleScripts but Automator workflows and apps.

It effectively runs as a stand-alone email client (so Mail doesn't have to be running), checking an IMAP account in the background. When you send an email to that address with a particular word in the Subject field and the full name of one or more scripts you've copied to its folder in the body, the scripts will run. It can also post Notifications, and because it's running as an email client, it can reply to your triggering email to report status, or list the available scripts if you've forgotten what they are, and delete the trigger email.

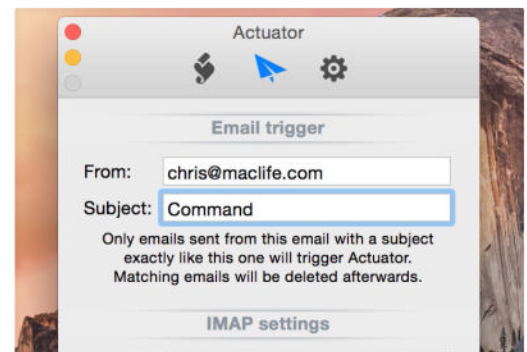
There are some example scripts – restart, unmount all drives, clean Safari history and more – but it would likely be intimidating to less confident, technical users, and there are some rough edges.

**THE BOTTOM LINE.** Slightly more friendly than using Mail and AppleScript. **CHRISTOPHER PHIN**

## ACTUATOR

- ➦ Clever, flexible, unobtrusive
- ➦ Only three bucks
- ➦ You can do a similar thing with built-in tools
- ➦ Still a little intimidating

**GOOD** ■■■■





## Leica Q (Type 116)

A compact camera with a 35mm sensor. Bliss

**\$4,250** **Manufacturer** Leica, [leica-camera.com](http://leica-camera.com)

**Features** 24MP 35mm sensor, Maestro II processor, 1080p 60fps video, Wi-Fi & NFC

Back in the old days, most photos were taken on 35mm film. Now, only really high-end SLRs and just a couple of compact cameras use image sensors that large. The Leica Q adds one more to the list of compact cameras – and it's wonderful. It's not that small for a compact, admittedly, but you get the full effect of its big 24-megapixel sensor, with very little noise and brilliant dynamic range in photos. With a maximum aperture of f/1.7 it's possible to restrict depth of field dramatically to focus attention on your subject and produce attractively blurred backgrounds. Most importantly, the Q is capable of capturing truly stunning images that have superb levels of sharp detail and vivid colors. The excellent included lens helps here too, free of distortion and great with glare.

The Q also looks and feels superb, with carefully crafted lines and a solid feel. It's not the most comfortable camera we've ever used, but it's easily good enough, and isn't hard to keep steady when shooting. Traditional controls make setting aperture and shutter speed quick and easy, and it has a fast and accurate autofocus system with a macro setting that brings the closest focusing distance to just 17cm. It's easy to see what you're shooting too, thanks to both the detailed touchscreen on the back and also the high-resolution electronic viewfinder.

Generally speaking, the Q is a real pleasure to use, but there are a few little issues worth mentioning largely because of the cost involved. The exposure compensation dial sounds rather tinny in action, for example, and the macro focus ring and manual focus release button on the lens are both slightly fiddly to use. It would also be nice if greater use was made of the touchscreen's capabilities, too – but these really are minor.

Although it has automated shooting options that suit novice photographers, the Leica Q is a serious camera for a serious price. It may lack some of the features of other modern compact cameras, such as a host of filter effects (though it does offer Wi-Fi), but the Q isn't worse for that. It means fewer unused options, and a focus on getting amazing images. And the Q delivers those.

**THE BOTTOM LINE.** A first-rate full-frame compact for those who like traditional controls and modern features like an electronic viewfinder. The Q is capable of producing beautiful images – for a high cost. **ANGELA NICHOLSON**

MacLife  
EDITORS'  
CHOICE

### LEICA Q (TYP 116)

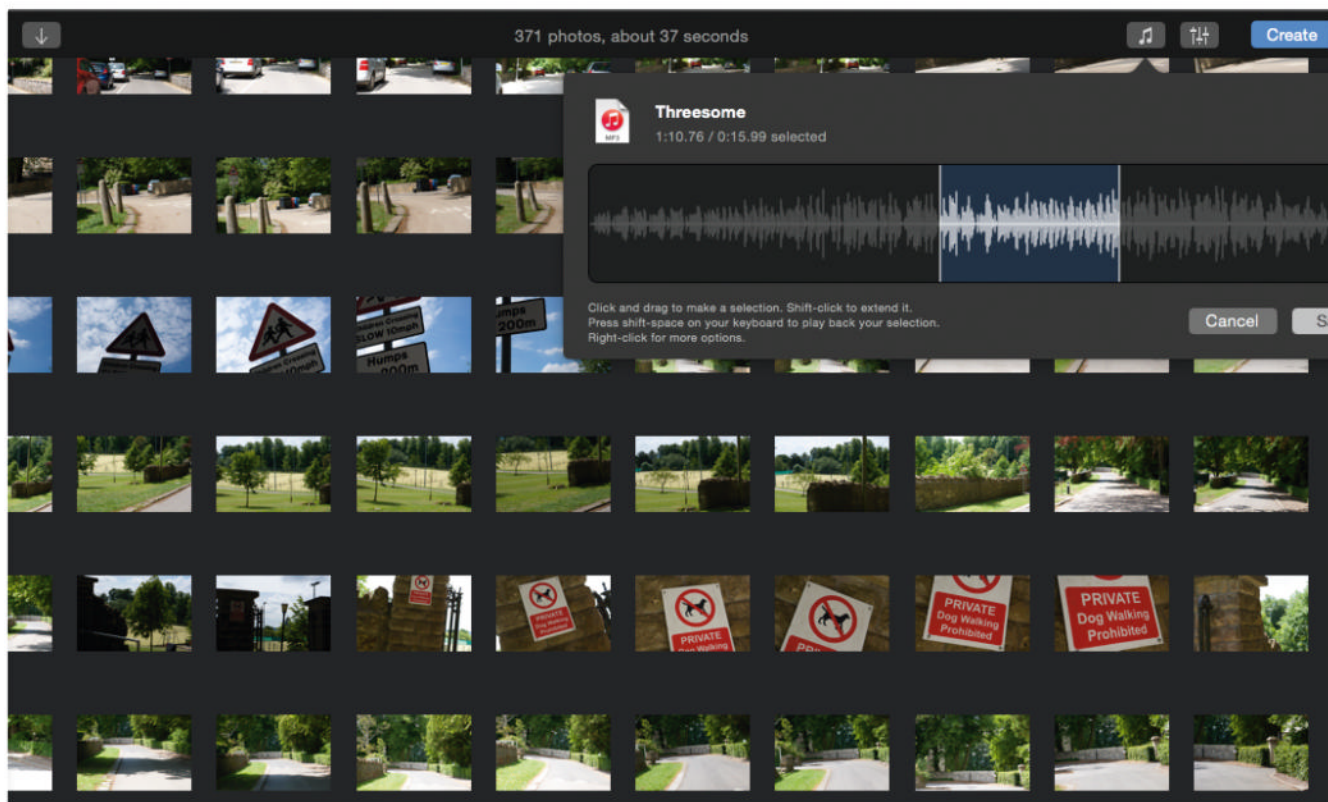
- Absolutely fantastic images from the full-frame sensor
- Traditional exposure controls
- Wide aperture lens
- So very expensive

**AWESOME** ■■■■■



The Leica Q is a high-quality camera with a full-frame sensor for amazing-quality shots.





This app does exactly what it promises – “still motion video” – but do you want that promise?

# Glimpses

A quick way to make “still motion” videos – if you actually want to

**\$24.99** **Developer** Eternal Storms Software, eternalstorms.at

**Requirements** OS X 10.10 or later

## GLIMPSES

- Easy to use
- Soundtrack editor is nicely focused
- Slightly basic feature set for the price
- Much-vaunted 4K feels like a gimmick

**OKAY** ■■■■■

This application is easy to use, looks good and does what it promises to do. But it’s a bit idiosyncratic, not cheap, and the old QuickTime Pro app can achieve the same basic effect...

The app’s job is to create “still motion” videos, wherein a series of still photographs are played one after the other. The result can be fun and it can be effective, as a way of throwing you into an impressionistic whirl to summarize a vacation, say, or a way to create pacing, such as taking few photos on the road leading up to a landmark, and then lots of photos of it.

The app itself is competent. You can import photos from Finder, Photos/iPhoto/Aperture, Flickr and Instagram, then sort them by date, title or even by color to set the chronology. Next, you can add one or more soundtracks, and there’s a simple yet flexible editor to let you

trim and concatenate these tracks. Set the finished resolution (including 4K, which feels like a bit of a “because we can” gimmick) and frame duration (optionally matching the duration with your soundtrack) and export.

We’d like the option of previewing the speeds rather than having to wait for the export, and an advanced editor where we could manually adjust the frame rate at points along the timeline to draw the viewer’s attention to particular shots would help justify the slightly high price tag, but the basics are there. Note, though, that if you have QuickTime 7 Pro still, you can use that to create still motion videos, albeit with a bit more complexity.

**THE BOTTOM LINE.** A competent app for creating still motion videos, if that’s what you want to do... **CHRISTOPHER PHIN**



# Tonality

A monochrome imaging app with plenty of tricks up its sleeve

**\$17.99 Developer** Macphun, [macphun.com](http://macphun.com)

**Requirements** OS X 10.8 or later

Macphun's approach to the complex task of a decent black and white image is Tonality, an app which applies a series of mono filters to your image which can be edited further.

The app's new version 1.2 update brings with it an improved image processing engine and new layer effects, plus support for Force Touch trackpads along with a wider range of raw files. You can also send your edited files directly to other Macphun products, Photos, iPhoto, Aperture, Photoshop or Lightroom (there's no support for Serif's new Affinity Photo, reviewed next issue, sadly). Shell out for the Pro edition and Tonality becomes a plug-in that runs inside many of those apps.

Open an image file in the app and it immediately becomes black and white. Along the bottom of the interface runs a bar of effects chosen from a Presets menu, each one immediately previewing the image you've loaded. Click on one and it's applied at 100% – a slider on the preview thumbnail allowing you to decrease the intensity of the effect. A panel on the right can then be used to alter the effect further, with a tone curve graph, exposure and color temperature sliders, and tools for split toning and adding colors back into the image.

Despite Tonality being marketed as dedicated to monochrome images, all the color information is preserved – the saturation sliders are just set to zero. Far



from being an app that just makes black and white images, it's capable of all sorts of color effects and vintage looks, especially when you factor in the grain and film effect filter that can load a custom texture file in addition to those included with the app.

A layering system allows you to build effects on top of one another, blending and masking (including new luminosity masks that select pixels based on brightness) to build up complex effects and sophisticated images. Once you're finished, you can share directly to social media or photo sharing sites, or export to your hard drive.

Tonality has a tendency to produce haloes around areas of high contrast in an image, but otherwise it's a competent image editor with an approach to altering your image that's as complex as you want it to be.

**THE BOTTOM LINE.** A great choice if you're into monochrome photography, and its color editing options are a bonus. **IAN EVENDEN**

Presets allow for quick and easy monochrome results but you can fine-tune the detail endlessly.



Despite its emphasis on black and white, Tonality is also highly capable of a variety of color effects.

## TONALITY 1.2

- Runs fast
- Supports many file formats
- Plays well with other apps
- Rather narrow appeal

**GREAT** ■■■■■

# Reformator

Convert and rename your photos in batches

**\$7.99** Developer Overmacs, overmacs.com

**Requirements** OS X 10.9 or later

Anyone who takes a lot of photos will know the misery of trying to rename lots of files from something like "IMG\_XXX" to be more searchable and easy to read. There are ways around this with Automator, but one of the most user-friendly methods is with an app.

Reformator offers this functionality and more besides. It pitches itself as a solution for processing multiple images, but can also work on just one file at a time. It could even function as a replacement for Adobe's organizational and processing app Lightroom, if you only process the occasional raw file.

The app's greatest strength is in converting and renaming large numbers of image files. It opens in an image browser from which you select the folder of images you want to work on. Some preparatory work is a good idea here, as no matter how many images you've selected in the browser, hitting the Continue button will only ever open the first file, with the others queued for batch conversion. Right-click a single image, or several selected files, and you can open them on their own by selecting Show Convert Settings, however.

It's not the most intuitive way of doing things, compounded by double-clicking opening the file in whatever external app it's associated with – Digital Photo Professional in the case of our Canon raw files, as we'd never bothered updating the file association to Lightroom.

Once you've sorted out which files you want to work on, you can edit their metadata right there in the browser, altering capture time if your camera's clock has gone askew, or adding a location from a map. Once you're done messing with the metadata, you can move across to the conversion window for Lightroom-like visual tweaks such as cropping, brightening, and color balancing. They're applied as filter layers, and can be turned on and off or deleted as you please. Once you're happy – and remember these filters will be applied to every file you've selected – create a naming convention and set the app in motion.

The speed at which it does the actual conversions varies depending on your Mac, but the biggest timesaver is not having to type in the same metadata information every time. There's not a lot here you can't already do if you're a Lightroom user, but if you want a subscription-free app that can batch-convert files and edit metadata, this is definitely worth considering.

**THE BOTTOM LINE.** Does a good job of batch processing, changing metadata and making some visual tweaks to your image files. **IAN EVENDEN**

## REFORMATOR

- ➕ Speedy in operation
- ➕ Many formats supported
- ➖ Occasionally opaque interface
- ➖ Preview images are low quality

**GOOD** ■■■■





Kiss goodbye to laborious file naming and say hello to your batch-converting friend.





We like the crazy robot look – at least it's different to the average router...

## Netgear Nighthawk X4 R7500

This is a fast 802.11ac router, but it's far from cheap

**\$280** Manufacturer Netgear, [netgear.com](http://netgear.com)

**Features** Four antennas, dual-band, quad-stream 802.11ac Wi-Fi up to 2.33Gbps, 1.4GHz dual-core processor, two USB 3.0 ports, eSATA port

### NETGEAR NIGHTHAWK X4 R7500

- ▶ Fast 802.11ac wireless performance
- ▶ Excellent speeds from the built-in USB 3.0 ports
- ▶ Limited client support for faster 4x4 802.11ac speeds
- ▶ Bland-looking software

**GOOD** ■■■■ ■

The Netgear Nighthawk X4 is a quad-stream 802.11ac router promising faster wireless speeds than triple-stream routers such as Apple's AirPort Extreme. The X4 offers improved speeds for 802.11n devices, twin USB ports and an eSATA port. But, at \$280, it's one of the priciest 802.11ac routers you can buy.

The Nighthawk X4 antennas are positioned around the unit, and there are 13 LEDs at the front to relay status information (although these can be turned off). Inside, you'll find a 1.4GHz processor. Additionally, there's a separate "offload" processor that runs at 500MHz.

Of course, as well as the four 5GHz 802.11ac streams, the Nighthawk X4 works fine if your laptop or USB wireless adaptor only supports fewer streams, 802.11n, or earlier standards. With three storage expansion options, Netgear is describing the X4 as Network Storage Ready, an interesting claim, since the file management

functionality built into most router software is often severely lacking in quality...

Netgear's interface has a sparse look, but it's not lacking in features. The ReadyShare section, for managing clients and shares on connected USB devices, is good, although it doesn't match a dedicated NAS. Netgear's Genie software offers versions for iOS and Android as well as Windows desktop software. It's okay, but there's room for improvement; the iOS version crashed once in use and is also visually unappealing.

But looks can be deceiving and the on-board software is still reasonably good. Setup is simple. Enter [routerlogin.net](http://routerlogin.net) into a browser, and the router automatically configures itself, including downloading firmware updates.

**THE BOTTOM LINE.** The X4 is a powerful router, especially when set up with a client that supports quad-stream 802.11ac – but that power comes at a price. **ORESTIS BASTOUNIS**



## Mycestro

Use your finger to conduct your cursor

**\$149** **Manufacturer** Innovative Devices, mycestro.com

**Weight** 0.5oz **Range** 30ft **Compatibility** Bluetooth Smart Ready

Mycestro is a small, three-button device worn on your index finger that allows you to control your on-screen pointer, instead of using a mouse or trackpad. In effect, it's a wireless mouse that can track movement across three dimensions rather than just the normal two.

You'll first need to plug the tiny wireless dongle into your Mac. The idea is that you touch your thumb to the side of the Mycestro to activate it and wave your hand in the direction you want the pointer to move, or slide your thumb to scroll.

Designed for use in confined spaces, the Mycestro does take a bit of getting used to and can feel a little imprecise – plus you'll need to raise the sensitivity lest you fall victim to wrist strain. While it has some potential, the humble trackpad is still a better bet for now.

**THE BOTTOM LINE.** It's certainly a nice idea, but the Mycestro needs more polish before it becomes an essential travel computing accessory. **ALEX BLAKE**

### MYCESTRO

- ✚ Easy to use
- ✚ Works with any app that uses mouse input
- ✚ Rechargeable battery not replaceable
- ✚ Expensive

**SOLID** ■■■■■

## Toshiba 3TB Canvio Basics

Tons of storage in a tiny package

**\$140** **Manufacturer** Toshiba, toshiba.com

**Capacity** 3TB **Speed** 5,700RPM

It's hard to be excited by hard disk drives and storage in general, but the newest addition to Toshiba's Canvio Basics range is the first 3TB 2.5-inch hard disk drive (internal or external) to appear on the market.

That 50% improvement over 2TB drives comes at a cost. You can grab a 2TB external 2.5-inch hard disk drive for just under \$60, but this 3TB drive is currently on pre-order for a whopping \$140. To put this in perspective, two 2TB Canvio hard disk drives would cost you less than this 3TB hard drive...

One thing's for sure, though: this drive is no slouch. The Toshiba 3TB Canvio is impressively fast without getting exceedingly warm to the touch or vibrating too much. When benchmarking, we saw sequential read/write speeds of 143Mbps and 136Mbps respectively. These scores are a significant improvement over what the 2TB version of the Toshiba Canvio Basics offered.

**THE BOTTOM LINE.** Fast, compact and packs more bytes per area than any other drive – what's not to like, aside from price? **DESIRE ATHOW**

### TOSHIBA 3TB CANVIO BASICS

- ✚ Fast performance
- ✚ Highest storage density on the market
- ✚ It's expensive
- ✚ Lack of backup software

**EXCELLENT** ■■■■■



# Garmin VIRB Elite

An action camera with GPS built in

**\$200 Developer** Garmin, [garmin.com](http://garmin.com)

**Features** 1080p HD video, 16MP stills, GPS, Wi-Fi, 3 hours recording time

The Garmin VIRB Elite blends action-camera features with GPS technology. Those features are light, with a maximum video resolution of 1080p at 30fps and GPS data recording, but no navigation or route planning. However, it balances them in a usable way that will appeal to many people.

The fairly large design makes it easy to handle, with direct access buttons covering the side of the case. The small screen is contrasty and although relatively low resolution when compared with smartphones, it's easy to see in bright sunlight and enables quick settings changes when needed. The stop/start slide switch is easy to operate, and the small screen enables you to navigate settings simply, or you can use it as a live view.

The VIRB Elite offers lens correction and image stabilization of its footage. The former can cause wavy distortion when used off-road, but the image stabilization is effective in smoother situations. Unfortunately, though, you can't use image stabilization without lens correction, so the limits of one affect the other.

On the back is a rubber flap which covers the camera's connectors, including USB and HDMI. Garmin's quick-release cradle system follows GoPro's mount style, so with the use of the adapter that comes in the box you can also attach the VIRB Elite to any GoPro mount. It's also waterproof, but only to a depth of one meter.

As well as direct control, the VIRB Elite also enables control from iOS devices. Connection simply involves activating Wi-Fi on the camera and locating the network on your mobile device. Once connected, the app enables you to adjust the settings as well as access live view and recording; surprisingly, it doesn't enable you to play back footage from the VIRB to your mobile device

Options for video resolution are limited but playback quality is good, showing natural color with plenty of detail and tonal gradation. Moving from dark to light areas does show a slight delay in the change to exposure, but this is quickly corrected. You can change the field of view through three zoom settings; this does slightly reduce the image quality but you'd be hard-pressed to see the difference.

Still shots have a maximum resolution of 16MP and, as with video, the color, tone and detail are all good, although there is a noticeable but acceptable barrel distortion, but that's fairly normal for this type of action camera.

**THE BOTTOM LINE.** The VIRB Elite is well designed, with a simple slide switch, easy-to-use mount and good filming results. **ALI JENNINGS**

## GARMIN VIRB ELITE

- Simple operation
- Good quality footage
- Limited-depth waterproofing (1m)
- Tricky to swap microSD cards

**GREAT** ■■■■■







The VIRB Elite is compatible with GoPro mounts, so there are lots of attachment options.



Tweak the Custom One Pro Plus's look and sound to your heart's content...

## Beyerdynamic Custom One Pro Plus

Get personal with these tweakable over-ear headphones

**\$299** **Manufacturer** Beyerdynamic, [north-america.beyerdynamic.com](http://north-america.beyerdynamic.com)

**Features** 16 design covers, variable bass reflex system, 5ft cable with mic and remote

This Custom One Pro Plus headphone set is fully tweakable to enable listeners to get personal with its looks and sound. The 'phones come stocked with a soft, plushy leatherette-covered headband. It's secured to a thick metal frame by Velcro, which allows for easy removal should you invest in a differently colored headband. Each sidearm doubles as a housing bracket for the large ear cups, which are spacious enough to fit your entire ear inside. The outside covers of the cups can be swapped out with the included Allen wrench. Helpfully, eight sets of covers are included from the get-go. Each cover has two designs, one on the front and another on the back, resulting in a total of 16 different designs.

Customization isn't limited only to the Custom One Pro Plus's physical traits, though.

You can adjust the bass response pumped through the ear cups. A four-way switch located on the bottom of each toggles between bass settings of varying intensity (Light Bass, Linear, Vibrant and Heavy).

Thankfully, the headphones don't push quality sound to the side just to fulfill the novelty of booming bass. The sound performance as a whole here is really good – a noticeable notch above most of the competition. The Custom Ones offer a grand, expansive soundstage; the mids are rich and the highs manage an impressive level of crispness.

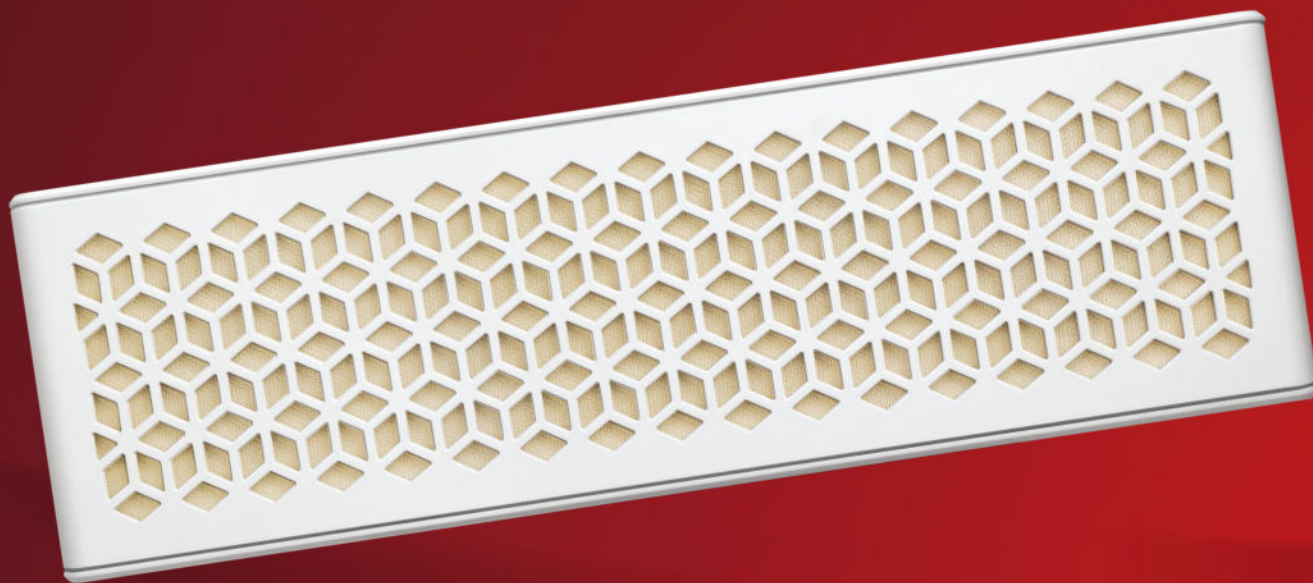
**THE BOTTOM LINE.** The sound quality and performance are enough to seal the deal for the Beyerdynamic Custom One Pro Plus, even without the extremely handy customization options. **CAMERON FAULKNER**

### BEYERDYNAMIC CUSTOM ONE PRO PLUS

- Super-customizable
- Stellar sound
- Adjustable bass response
- Lacks volume controls

**EXCELLENT** ■■■■■





# Creative Muvo Mini

A capable, weatherproof Bluetooth speaker with subtle style

**\$59** **Manufacturer** Creative, [creative.com](http://creative.com)

**Features** Bluetooth connection, NFC, water resistant, 10 hours' battery life

**T**his jack-of-all-trades Bluetooth speaker comes highly recommended for listeners with a sub-\$100 budget who don't want to sacrifice sound quality in favor of saving a buck.

The rectangular Muvo Mini is covered in a smooth, matt plastic in gray, red, blue, or white. The speaker's front is capped with a grille, with a neat perforation pattern. Beneath the grille, a slick mesh layer covers the dual drivers and the bass radiator. On top, the Muvo Mini sports a set of buttons and a site for tethering your device. From left to right, you get on/off, Bluetooth and buttons for increasing and decreasing the volume. The Bluetooth button offers multiple functions; you can hold it for a few seconds to put the speaker into pairing mode, and also answer and hang up a phone call with a single press. Surrounding the buttons are a few LEDs to indicate connection and battery status. Around the back, a rubber flap covers the micro USB and 3.5mm ports. Keep this flap closed if you plan on exposing the Muvo Mini to water. Inside the box, you'll find a micro-USB cable that's used to charge the Creative Muvo Mini.

The Creative Muvo Mini puts out an impressive sound that defies the bounds of its small form. Frankly, this speaker is leaps ahead of the competition at this price point. The rectangular box excels at avoiding distortion even at high volume levels. Its front-facing bass radiator does an admirable job of pumping out the low-end notes, and you'll appreciate the warm mids and highs.

Inside is a battery that lived up to its 10-hour between charges claim in our tests.

Creative's Muvo Mini has already provided more than enough reason to jump at its low price tag, but it has one more trick up its sleeve: weatherproofing. This speaker has an IP66 rating, so it's dustproof and waterproof just shy of the point of being submerged. Spray it all you want, just don't dunk it underwater.

**THE BOTTOM LINE.** The Creative Muvo Mini contains every desirable feature you'd want in a Bluetooth speaker: full sound, attractive design, long battery life – and the cherry on top, weatherproofing. For under 60 bucks, that's an unbeatable deal. **CAMERON FAULKNER**



## CREATIVE MUVO MINI

- ➕ Full sound
- ➕ Very affordable
- ➕ Weatherproof
- ➖ Can't charge devices

**AWESOME** ■■■■■





Battles are fun at first, but they get repetitive a little too quickly.

# Massive Chalice

A tongue-in-cheek intro to strategy gaming

**\$19.99** **Manufacturer** Double Fine Productions, doublefine.com

**Requirements** OS X 10.6.8 or later, Intel Core Duo, 4GB RAM, 256MB VRAM

There's something admirable about a strategy game that's simple enough for beginners to understand. Here, you'll direct heroes in both battle and breeding for 300 years, guided by the titular Massive Chalice, building up the real power necessary to extinguish your enemy.

The world map fits on one screen, but you can choose in which sections to build keeps for breeding more heroes, Sagewright's Guilds for speeding up research, or Crucibles for boosting your heroes' experience. There are basically only three kinds of hero (one close-quarters fighter, two that attack at range), but breeding between these classes mixes up the skills their offspring can learn, and you can research better weapons, armor, and items.

Every few years, your enemy attacks a couple of regions, and you may only pick one to defend,

inevitably motivated by the rewards for each and how close each region is to being totally overwhelmed. In the turn-based battle that ensues, you manage a maximum of five heroes with a handful of moves each, pitting them against a limited range of enemies.

**Because this war lasts for 300 years, you have to ensure a continual supply of heroes - mainly by breeding them.** The fertility levels and personality traits of the parents determine how many and what kind of offspring the arranged marriage produces - perhaps a huge brood of drunken nearsighted redheads or especially rebellious daughters. It's a nice twist, but isn't enough to elevate the game.

**THE BOTTOM LINE.** Turn-based strategy for beginners, with interesting ideas that don't quite go the distance. **JORDAN ERICA WEBBER**

## MASSIVE CHALICE

- ▶ Systems are easy to understand
- ▶ Genetics system adds interesting considerations
- ▶ There's little attachment to your heroes
- ▶ Ends up feeling rote

**GOOD** ■■■■ ■

# Heroes of the Storm

Life (and death) in the fast lane

**FREE Developer** Blizzard Entertainment, blizzard.com

**Requirements** OS X 10.9 or later, Intel Core 2 Duo, 4GB RAM, Nvidia GeForce GT 330M or ATI Radeon HD 4670

Heroes of the Storm is Blizzard's (of World of Warcraft fame) breezy spin on the Multiplayer Online Battle Arena genre. MOBAs, as they're called, are a Byzantine mix of role-playing, action, and real-time strategy. As in all such games, the goal of HotS is to destroy the opposing team's base while protecting your own. Maps are divided into "lanes," each studded with crenelated fortresses and patrolled by diminutive minions. Destroying enemies and their infrastructure grants experience points (XP), which are used to augment each player's special abilities with "talents." The result is a frantic tug-of-war as two teams of five jockey for position until one eventually overwhelms and overruns the other.

HotS stands out by presenting a roster of Blizzard's most iconic characters. There's Diablo from his eponymous game, a hulking bruiser who body-slams foes, or Starcraft's Kerrigan, a lithe spider-queen who leaps into the fray from the shadows.

From there, Blizzard's digressions from the norm are subtler. For example, XP is shared among the team instead of gained individually, preventing dominant players from running roughshod over the entire match. Each of HotS' seven maps has unique objectives, too: collect the souls of the damned in the Lost Mines, for example, to awaken a formidable golem.



Li Li, an anthropomorphic panda, is a healer and not suited for a two-on-one brawl. It's hasty retreat time...



Finally destroying your opponent's core rewards you with a glorious explosion of color.

Other minor touches keep HotS fun and lightweight. Matches are shorter than the competition at about 15 minutes, while characters' talent options are structured to be understandable while giving players plenty of options. Quests prioritize a few daily games instead of extended sessions.

Like most MOBAs, HotS is free: you can play as a subset of its overall characters for free, but the selection rotates weekly – you'll have to buy your favorite characters with in-game currency or real money (starting at \$3.99). The game's most competitive modes are locked away until you own 10 different heroes. On the one hand, it's galling to stick certain features behind a pay wall. On the other, it's a realistic concession: HotS is easier to understand than other MOBAs, but it's still an intricate, esoteric diorama.

**THE BOTTOM LINE.** A dynamic and accessible blend of action, strategy and teamwork. **JOSEPH LERAY**

## HEROES OF THE STORM

- Easy-to-learn intro to a complex genre
- Matches are short, tense, and full of action
- Strategy and customization can be slightly limited
- New characters are pricey; best modes are behind the paywall

**EXCELLENT** ■■■■■





# ASK

TECH SUPPORT & TECHSPLANATIONS



Don't worry, your old iPhoto events are preserved when you migrate to Photos.

## MISSING THE EVENT(S)

What has happened to iPhoto? I used to have all my pictures organized using named Events and this worked very well, particularly given that it was easy to merge multiple Events together, if they spanned several days (holidays, for example). Now in Photos all my pictures appear in one long list, with no way of naming the occasion. Where are my Events?

They are gone. Apple decided that there was too much overlap between Events and albums, and since they couldn't very well have a photo app without albums, it was events that had to go.

You're making this sound worse than it is though. The "All Photos" album is just a giant scrolling list of every picture,

sorted by date, true. But the Photos view (at the top of the sidebar) will break this up with date headers, so that all the pictures taken on the same day are grouped together. If they were taken on a camera that records the location, this will also be shown in the header. For holidays, that's probably all you need, but

if you want to group your images more precisely, you can just drag them into a new album and name it as you would have previously named the Event.

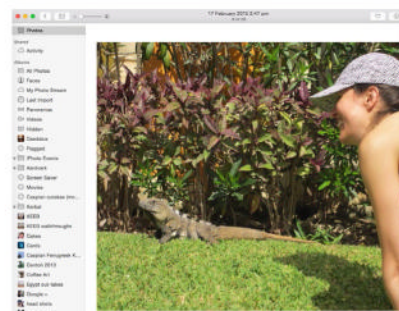
You can also use keywords and Smart Albums to create albums that automatically update as you add new pictures. On top of all that, when you migrate from iPhoto, the Photos app creates a separate album for each of the Events you had previously, listed under "iPhoto Events."

## Hanging on to iPhoto

**I intend to upgrade my iMac to a newer Retina screen model. I currently still use the iPhoto app rather than the new Photos app and will want to do so on the new iMac, at least for the time being. Is there a way I can copy or transfer my current iPhoto app to the new iMac? I know that I could use Migration Assistant to transfer all my files and apps to the new iMac, but would rather not use that option.**

The latter procedure wouldn't work anyway. Migration Assistant won't copy over the iPhoto app, just the iPhoto library, which will then get imported to Photos the first time you start the app.

You should still be able to copy the iPhoto app over, if you have a Time Machine backup, or by putting the old iMac in Target Disk mode. Although iPhoto has been replaced, it should continue to work for the duration of Yosemite's life at least – although, as with all discontinued software, there's no cast-iron guarantee of this.



The new Photos app improves on iPhoto, but you can keep using the old app for now.

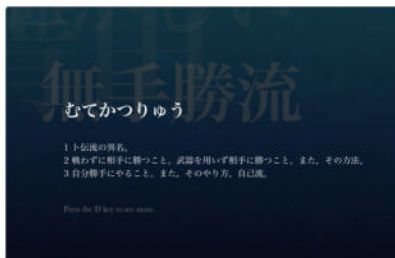


## Screensaver language lessons

I recently came across the “Word of the day” screensaver on my Mac and this seems like it would be a great way to brush up on my Spanish. But the Screen Saver Options button only gives me the option of using the New Oxford American dictionary or something that I presume is Japanese. Is there a way of adding extra dictionaries to this?

Unfortunately not. This screensaver was added for Snow Leopard with just US English and Japanese dictionaries and never updated after that. We don’t think it’s even officially supported from Lion onwards.

Of course there are Spanish flashcard language tools on the App Store that work in a similar way, among many other language tools, but you’d need to open the app manually each time.



The word of the day is okay for brushing up on your Japanese, but not much else.

## Yet more Photos trouble...

When the Photos app arrived, I was happy to move from Aperture because I wanted to make use of the options to store all my photos in iCloud – both to have an off-site backup, and also to have access to all my pictures across all my iOS devices. It took around a week to upload all 300GB of photos and videos, but the convenience and security were worth it.

I had an annoying problem with the HDD and decided to clone and erase the disk then copy across the files and folders back onto it. I named it the same as before, and dragged the files

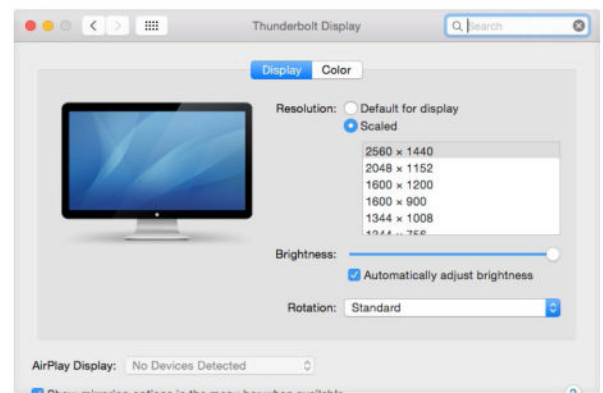
## > Increasing monitor refresh rate

I have a Mac mini connected to an LG monitor. This display is very crisp and clear but I have noticed that I can detect a slight flickering. The refresh rate is 60Hz, which I think may be the problem. Unfortunately I can’t select the 75Hz option because it won’t let me. If I change from “Best for Display” to “Scaled,” some of the resolutions will let me use 75Hz, but they all distort the screen. Can this be fixed?

Probably not with your current monitor. The maximum refresh rate is a function of how quickly the monitor can update every pixel on the screen. The higher the resolution,

the more pixels have to be refreshed and, beyond a certain point, the monitor must drop from 75 times a second (75Hz) to the next step down, which is 60Hz. For the LG E2242T, for example, the highest resolution that supports 75Hz is 1,280x1,024. This uses a 5:4 aspect ratio, so

it will look stretched when it is interpolated to fill a screen that is designed for 1,920x1,080 (16:9 aspect ratio). You can use the monitor’s on-screen menu to change from widescreen to “original,” which will get rid of the distortion, but you’ll get black bars at the sides of the screen instead.



and media back. The Photos library opened just fine, but now the app thought it was a brand new set of photos and offered to upload them all to iCloud – again.

In the end, I had to delete the library on my HDD, open Photos with no library selected, and then download the photos from iCloud within the app – all for a set of photos I already had a copy of! Any idea why?

We haven’t been able to absolutely confirm this, but it looks like Photos might be saving the full path to each image when it uploads them to iCloud, including the UUID (universally unique identifier) of the disk volume. This could be necessary to allow you to back up the photo libraries from multiple Macs to the

same iCloud account. The libraries on two Macs would have the same path name by default, but the UUID would differ so the backups wouldn’t overwrite. But erasing your disk and reformatting it means it gets assigned a new UUID, so iCloud treats the restored files as new copies in a different location.

Cloning the drive back again, instead of just dragging the folders across, would restore the original UUID but might conceivably mean you’d recreate whatever problem you had originally. The SuperDuper! backup utility ([shirt-pocket.com](http://shirt-pocket.com)) has a secret command-line tool that will let you force the UUID of a volume to whatever you like, so you could use this to restore the UUID to the previous value. But this is pretty



Don't bother defragging a full hard disk if you can upgrade.



>>> technical and only works if you have made a note of the previous UUID name of the volume. Ultimately, cloning the drive back is the only practical way to avoid iCloud uploading everything again.

## Defragging is unnecessary

**I have a Mac Pro that is a few years old and still mostly going strong, but I feel like it's starting to show its age now and I wonder if a defragging utility such as Drive Genius 4 might help restore some of its original speed. I mostly use my Mac for music production and I have two 500GB drives. The startup disk is quite full, but there is still plenty of space on the other one for now.**

Disk fragmentation happens when files get split into several chunks to tuck them into the little pockets of free space left behind when other, smaller files were deleted. As your drive fills up, your files

get scattered and it takes much longer to read and write them.

That's the theory. In practice, you can completely ignore disk fragmentation. OS X already uses several strategies to minimize fragmentation occurring in the first place, and will automatically defragment the most commonly used files on the startup disk.

It's true that this becomes much less effective on drives that are almost full, but the best way to fix that is to upgrade to a larger disk, not defragment the one you have. A brand-name 1TB internal hard disk costs less than \$50 on Amazon; this is half the price of Drive Genius, and a good deal more effective.

## Disk space disaster

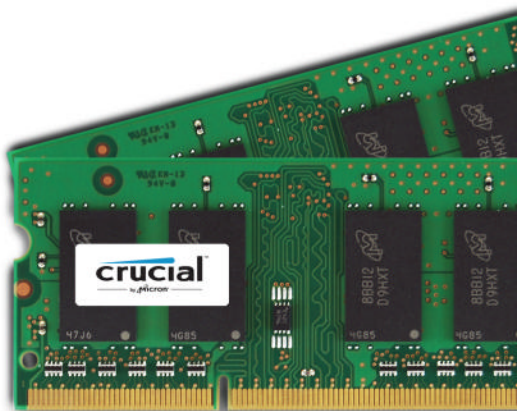
**When I'm processing raw files in Photoshop, it brings up the message "Your Mac startup disk has no space for application memory" and I have to**

**force-quit. I don't have anything else running at the same time and I have an iMac with 16GB RAM, a 256GB SSD that shows 100GB free, plus a 2TB HDD. I have nothing in the trash and don't understand why it's happening.**

OS X constantly swaps out portions of memory on and off the disk in order to keep the things you are most likely to want in physical RAM, since this is much faster. When OS X can't expand the amount of data in virtual memory, it concludes that the drive must be full and throws up the warning message.

We know the drive definitely isn't full, so something else must be causing it to fail. Faulty disk permissions can sometimes do this, and it's an easy fix, so repair permissions on the startup disk from Disk Utility. If this doesn't help, you may have a fault in your physical RAM. You could try ordering a replacement RAM module from [crucial.com](http://crucial.com) and swap out each of the RAM sticks in your iMac in turn until the problem goes away.

Finally, it's also worth checking your Photoshop plug-ins. A bug in one of these can cause the amount of memory Photoshop uses to steadily grow during your session. Try disabling your plug-ins one at a time in Photoshop.



A faulty RAM stick might mean you're working with less memory than you think.

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# CREATE

HOW TO DO ANYTHING ON YOUR MAC, IPHONE & IPAD

## Monitor gas costs with Numbers

Use Numbers to track your car's gas-guzzling ways

### REQUIRES

- > Numbers on your Mac or iOS device, a few gas receipts

### LEVEL

- > Easy

### IT WILL TAKE

- > 1 hour



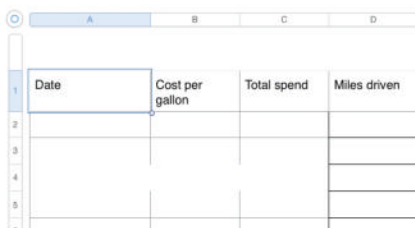
**AFTER HOUSE PAYMENTS**, your car is probably your biggest annual expense. The problem is that tracking how much it's costing you – and whether you might be able to save money – can be tricky. Computing your car's gas mileage is hard enough, but the various other expenses – parts and repairs, insurance, tax and so on – all add up over a year and make a real difference.

The answer, of course, is a spreadsheet. Data geeks like us have spreadsheets for all kinds of things, but because of the sheer number of data points your car produces – miles driven, parts to

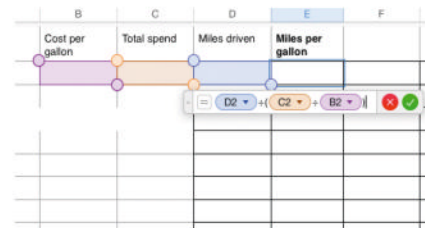
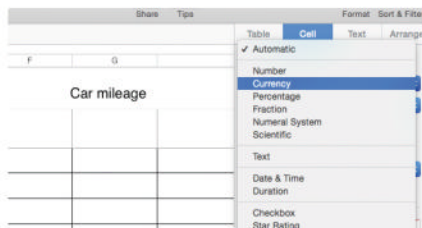
replace and so on – spending a little time creating a document that you can quickly fire a few new numbers into will help you keep track better.

Not only will a detailed spreadsheet reveal the facts about what your car costs to drive – which might prompt you to drive it more or less – it can also help guide you when it comes to buying a new car. You might also be able to head off breakdowns; a sharp drop in a car's fuel economy could hint at mechanical problems. Here, we'll show you how to create a spreadsheet with a few simple formulae to help keep on top of things: just keep it up to date. **DAVE STEVENSON**

### How to Set up a mileage spreadsheet



	A	B	C	D
1	Date	Cost per gallon	Total spend	Miles driven
2				
3				
4				
5				



	B	C	D	E	F
	Cost per gallon	Total spend	Miles driven	Miles per gallon	
2			=B2/(C2*B2)		

#### 1 Spread out

To track gas use, create a four-column spreadsheet. Select the top-right cell and name it "Date." Next cell is "Cost Per Gallon," then "Total Spend," and the last "Miles Driven." Keeping these columns up to date is easy: keep your gas receipts for the first three columns, and take a mileage reading each time you fill up for the Miles Driven entry.

#### 2 Formatting

Select the first column by clicking the letter A. In the Inspector panel (go to View, then Inspector if not there), choose Cell. Under format, choose Date & Time. Choose your format for the date; select None under the dropdown box for Time. Leave column B set to Automatic, and choose Currency for column C. Column C can be formatted as numeric.

#### 3 MPG column

Create a fifth column and call it Miles Per Gallon. In the cell beneath we're going to work out the number of gallons of fuel going into your car and divide that figure by the miles driven. The exact formula is:  $D2 \div (C2 \div B2)$ . D2 is the miles driven, divided by total spend. Your total spend is split into the number of gallons put into your car.

## How to Calculate your car costs

Car mileage

Miles driven	Miles per gallon	Gallons in	Gallons left
480	32	15	3
478	33	15	3
440	28	16	2
509	34	15	3
496.6	36	14	4
472	34	14	4

Cost per gallon	Total spend	Miles driven	Miles per gallon
\$3.37	\$50.55	480	32
\$3.36	\$48.90	478	33
\$3.29	\$51.20	440	28
\$3.75	\$55.80	509	34
\$3.85	\$53.60	496.6	36
\$3.82	\$53.30	472	34
\$3.79	\$57.00	554.0	37
\$3.79	\$54.08	451.1	32
\$3.96	\$54.60	490.6	36
\$3.89	\$53.74	484.1	34

Car mileage

Miles per gallon	Gallons in	Gallons left	Cost
32	15	3	Dec 2013
33	15	3	Dec 2013
28	16	2	Dec 2013
34	15	3	Jan 2014
36	14	4	Jan 2014

### 1 Between fill-ups

Here we've added the amount of fuel remaining each time we fill up – it can be useful to know how much is left when the fuel light comes on, so you can decide whether to stop immediately, or wait for a better-priced fill-up.

Cost	Amount	Running total	Cost per mile
3 Dec 2013 bought the car	\$30,000	\$33,372	\$3
3 Dec 2013 timing belt change	\$600		
2 Dec 2013 insurance	\$920	Total miles	
3 Jan 2014 tax	\$140	10,603	
4 Jan 2014 wipers	\$25		
4 Jan 2014 heater cable	\$20		
3 Jan 2014 heater valve repair	\$20		
4 June clutch cylinders	\$220		
4 August pipes	\$250		
4 October wipers	\$25		

### 2 Gas left

Working this out is simple. The first column, Gallons in, simply takes your total spend and divides it by the cost per gallon of the gas you've just put in. The formula looks like this: C2÷B2. The result is the number of gallons in.

14	4	Jan 2014 heater cable	\$20
15	3	Jan 2014 heater valve repair	\$20
14	4	June clutch cylinders	\$220
14	4	August pipes	\$250
14	4	October wipers	\$25
14	4	August insurance	\$443
17	1	November service	\$130
12	6	2014 smog test	\$55
15	3	Coolant Apr 15	\$20
16	2	Windscreen wash Apr 15	\$3
16	2	April 2015 – new tyres	\$450
16	2		

### 3 Tank capacity

For the number of gallons left in your car each time you fill up, you'll need to know the capacity of your tank. The formula is simply the number of gallons your car takes, minus the result of the formula in step two.

esage

Cost	Amount	Running total	Cost per mile
3 Dec 2013 bought the car	\$30,000	\$33,372	\$3
3 Dec 2013 timing belt change	\$600		
2 Dec 2013 insurance	\$920	Total miles	
3 Jan 2014 tax	\$140	10,603	
4 Jan 2014 wipers	\$25		
4 Jan 2014 heater cable	\$20		
3 Jan 2014 heater valve repair	\$20		
4 June clutch cylinders	\$220		
4 August pipes	\$250		
4 October wipers	\$25		
4 August insurance	\$443		
1 November service	\$130		
6 2014 smog test	\$55		

### 4 More numbers

It's possible to work out to the nearest cent how much your car costs to drive. To do this, you'll need more numbers – namely the cost of your car tax and insurance, and then the cost of any other expenditure per year.

Amount	Running total	Cost per mile
\$30,000	\$33,372	\$3
\$600		
\$920	Total miles	
\$140	10,603	
\$25		
\$20		
\$20		
\$220		
\$250		
\$25		

### 5 Running costs

Here we've made a list of running repairs and upkeep costs, from windscreen wash to insurance. The left column describes what's been bought, and the right-hand one how much spent. Format this column as "Currency."



### 6 Total spend

Create a column next to Amount headed "Running Total." The formula you need is: sum(X)+sum(Y), where X is the letter of the column with your Total Spend per gas stop, and Y is the amount you've spent on other stuff.

Car mileage

Date	Cost per gallon	Total spend	Miles driven	Miles per gallon	Gallons in	Gallons left	Cost
31 December 2013	\$3.37	\$50.55	480	32	15		3 Dec 2013 bought the car
28 January 2014	\$3.29	\$48.90	478	33	15		3 Dec 2013 timing belt change
26 February 2014	\$3.75	\$51.20	440	28	16		2 Dec 2013 insurance
16 March 2014	\$3.75	\$55.80	509	34	15		3 Jan 2014 tax
13 April 2014	\$3.85	\$53.60	496.6	36	14		4 Jan 2014 wipers
14 April 2014	\$3.82	\$53.30	472	34	14		4 Jan 2014 heater cable
13 May 2014	\$3.79	\$57.00	554.0	37	15		3 Jan 2014 heater valve repair
31 May 2014	\$3.79	\$54.08	451.1	32	14		4 June clutch cylinders
18 June 2014	\$3.96	\$54.60	490.6	36	14		4 August pipes
28 June 2014	\$3.89	\$53.74	484.1	34	14		4 October wipers
6 July 2014	\$3.79	\$57.00	554.0	37	15		4 August insurance
14 August 2014	\$3.85	\$53.60	496.6	36	14		1 November service
7 September 2014	\$3.82	\$53.30	472	34	14		6 2014 smog test
22 September 2014	\$3.82	\$53.30	472	34	14		
10 October 2014	\$3.37	\$50.55	480	32	15		
24 October 2014	\$3.29	\$48.90	478	33	15		
10 November 2014	\$3.75	\$51.20	440	28	16		
16 January 2015	\$3.75	\$55.80	509	34	15		
27 February 2015	\$3.75	\$55.80	509	34	15		
15 March 2015	\$3.85	\$53.60	496.6	36	14		
3 April 2015	\$3.82	\$53.30	472	34	14		
13 April 2015	\$3.79	\$57.00	554.0	37	15		

### 7 Cost per mile

You'll need to knock up a running total of the Miles Driven column. Create a formula that divides the running total (your total spend) by the number of miles driven and voila – you'll see the amount your car costs to drive a mile.

### 8 A visual view

Here, we've used Numbers' graph tool to create a visual representation of the car's fuel economy over time. A long-term decline might suggest a mechanical problem, for instance, or alert you to other potential problems.



The longer you use this spreadsheet the more useful it will become. The result: more knowledge about what your car's costing you, and cheaper driving.



Grandma's Garden

## Creating albums from Photos

Easily design and order photo albums and cards using the Photos app

### REQUIRES

> OS X 10.10.4 or later  
for Photos

### LEVEL

> Easy

### IT WILL TAKE

> A few hours



**APPLE HAS TALKED** a lot about its new Photos app for the Mac, and how it uses iCloud Photo Library to store your photos online so you can share them with others. But that doesn't mean traditional printed photography has gone out of style. In fact, digital photography has made it even easier to use services such as Snapfish and Shutterfly, which allow you to upload photos and design personalized photo books, calendars and greeting cards.

If you have a Mac you can do this all yourself, using the creative tools in Photos. Of course, iPhoto also had tools for designing and printing photo books and other documents – and most of the design tools we show you here are still

available in iPhoto if you haven't yet upgraded to Photos – but Photos puts a greater emphasis on creative projects, with a new Projects tab that sits alongside the other options for photo-editing and online sharing. You can even order your printed books from within Photos, using Apple's own printing service. **CLIFF JOSEPH**



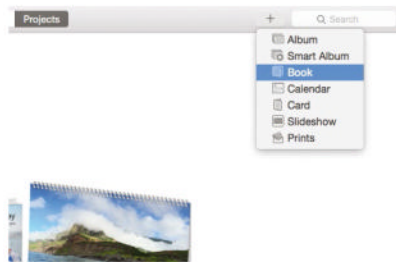


## How to Create a photo book



### 1 Projects tab

As with iPhoto, Apple's new Photos app makes it easy to share online. But sometimes it's good to do things the old-fashioned way, so Photos includes a Projects tab that helps you design and print high-quality photo books.



### 2 Book-keeping

Click + in the top-right corner of the Photos window to create a new project. There are several options here; however, we want to create a printed photo album - which Photos refers to as a Book, rather than an Album.



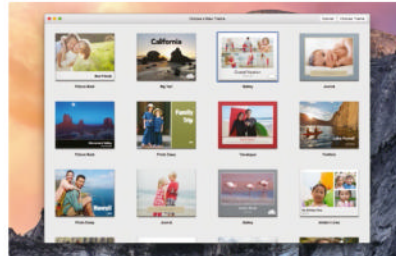
### 3 Classic design

Photos can design books in a number of formats. The Classic style is a high-quality hardcover with a wide, rectangular layout, a dust-jacket and sleeve. You can also opt for a smaller hardcover book, or a soft cover one.



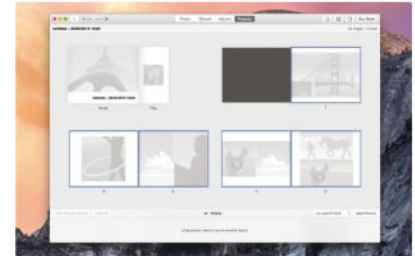
### 4 Pages and prices

Photos can check online and tell you the latest prices for various formats. Prices start at \$9.99 for a soft cover book, and go up to \$39.99 for the largest Classic book format. Prices include 20 inside pages, plus front and back covers.



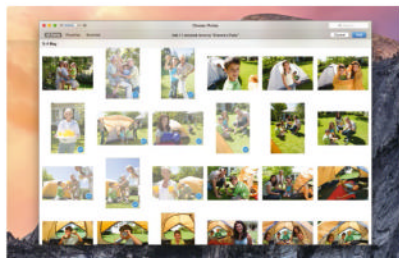
### 5 Template themes

Once you've chosen the format, you will be presented with a series of themes - templates with different layouts. You can still customize the layout later, so for now just choose any theme you like the look of.



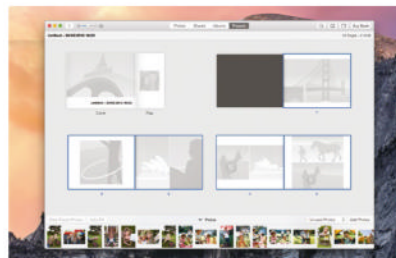
### 6 Instant layout

Here's the plan of our book. Each page has a slightly different design to add variety but you can change the layout as you go along. The next step is to find the photos you want to use in the book, so click the "Add Photos" button.



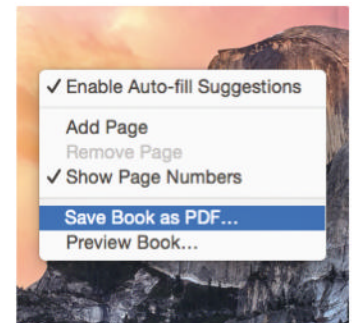
### 7 Adding photos

Photos now takes you to its main library and shows all photos organized by date. Click ones you want to use; these are highlighted with a blue check mark. Choose as many photos as you want, and then click the "Add" button.



### 8 The in-tray

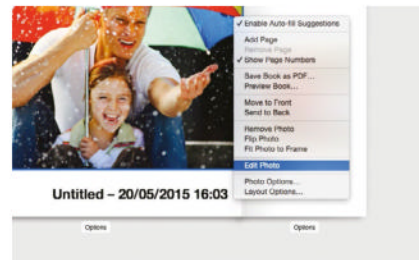
Photos are placed in the tray at the bottom of the screen; drag and drop photos from the tray onto a page. You can also select multiple photos then click the Auto-Fill button. Photos will try to select the best photos for each page.



### PREVIEWING PRINTS

You can get a preview of your printed book by right-clicking any page in the book. This allows you to save the book as a PDF file to open up in Preview.

## How to Start building your photo album



### 1 Cover spread

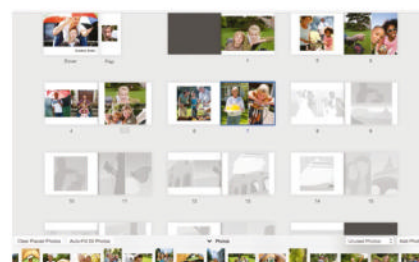
Let's start with the cover. The book layout is organized into groups of two pages - known as a "spread" - and double-clicking on one zooms in to give a close-up view. The cover is important, so find a really great photo to use for it.

### 2 Rainy days

We've found a shot we like for the cover, and put a smaller photo on the inside flap. However, that cover shot is a bit too dark, and we need to give the book a title. No problem - Photos allows you use all of its normal editing tools.

### 3 Editing options

There are several ways to switch to editing mode. You can click the cover photo then press the Options button below the page to open the Layout Options palette; or simply right-click on the photo and select Edit Photo.



### 4 The bright side

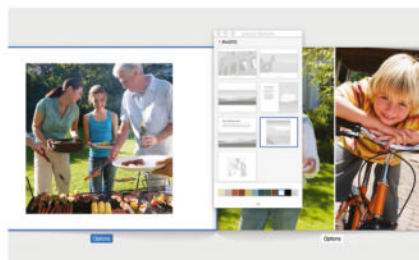
That takes us into Photos's editing window, where we can adjust the brightness and contrast. We can use other editing tools as well, such as filter effects, red-eye removal, or perhaps cropping and resizing the photo to better fit the page.

### 5 Text tools

When you're finished adjusting the photo hit Done to return to page layout mode. Then type the book title into the text box under the photo. Double-click the text to open the Text Options, which lets you choose typeface, size, and so on.

### 6 Auto additions

To leave the cover and look at the rest of the book, click the left-arrow symbol in the top-left corner of the Photos panel. Then, we quickly fill some pages by selecting photos, then clicking Auto-Fill. It's a good start, but we'll want to tweak them.

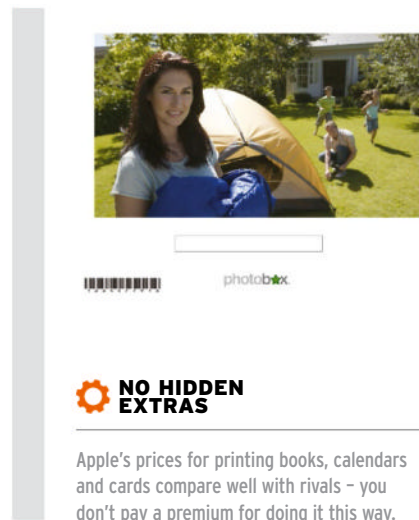


### 7 Changing pages

Auto-Fill sometimes goes wrong, and it looks odd having a photo floating on its own in the middle of the left-hand page of this spread. But you can edit the layout of each individual page. To do this, just double-click the white background.

### 8 Editing layouts

That opens the Layout Options palette. This page has only a single photo on it, so the palette starts by highlighting the current layout option in blue, and shows us alternative layout options that also use just one photo.



**NO HIDDEN EXTRAS**

Apple's prices for printing books, calendars and cards compare well with rivals - you don't pay a premium for doing it this way.

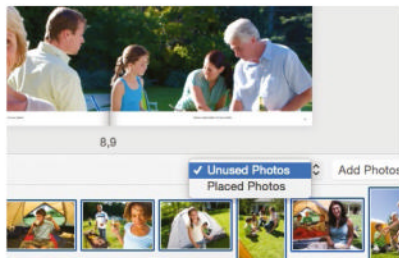


## How to Customize page layouts



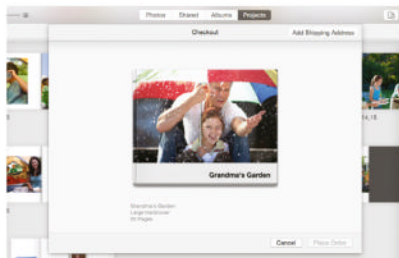
### 1 Changing layouts

You can change the page layout by clicking the small previews in the Layout Options palette; Photos instantly changes the layout while keeping the original photo on the page. Use the standard Undo command to revert.



### 4 Keeping track

Use the Add Photos command to fetch more photos whenever you want. To help keep track of your photos there's also a set of menu commands that adjust the tray so it only shows photos already used, or those yet to be used.



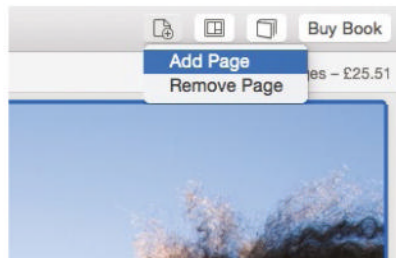
### 7 Order book

When you're happy with the design, press the Buy Book button to place your order. Only credit cards can be used, though; you can't pay with iTunes gift cards or any existing credit on your iTunes account.



### 2 In contrast

You can also change the page layout completely. Scroll down in the Layout Options palette to see several that use multiple photos. We'll contrast the two vertical photos on the right-hand page with two horizontal photos at left.



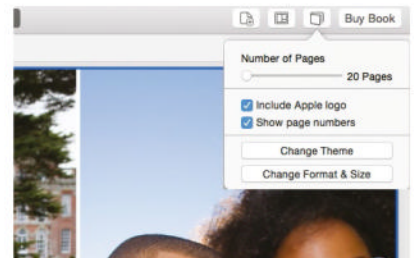
### 5 Adding pages

The standard themes are all for books that have 20 inside pages, plus front and back covers. You can add extra pages using the command shown here - Photos will update the cost of the book. You can remove pages, but not below 20.



### 3 A long stretch

Keep scrolling down the Layout Options palette to see other layouts to experiment with, including text pages and even maps that you can zoom in to show locations visited. You can also stretch a picture across two pages.



### 6 Quick change

If you decide you're not happy with the design of your book, use this menu to change the entire format, theme, or size of it. Any photos or text you've already placed in the book will remain in place, but you may need to tidy things up.



Websites come and go all the time - who can be sure that Facebook or Instagram will be around in a few years' time? However, your printed photo book will make a great keepsake or gift for family and friends for decades to come.





# Migrate Boot Camp

Move your entire Windows setup onto a new Mac with ease

## REQUIRES

- > A Mac with an existing Boot Camp setup, Windows 7 or 8, Winclone 5 Standard, and a 16GB+ USB drive

## LEVEL

- > Medium

## IT WILL TAKE

- > 2-3 hours



**APPLE'S BOOT CAMP** allows you to start up your Mac in Windows, not just OS X. It enables the use of business apps that may not be available for the Mac, designers and developers can test websites and apps on Windows, and you can choose from many more games.

However, if you upgrade or replace your Mac, you need to start all over and reinstall Windows on the new Mac, along with all your Windows apps and games. That can take ages because some games are tens of gigabytes in size. Then there's the trickiness of Windows' activation process. Apple's OS is free these days, but Windows still costs almost \$100.

Winclone ([twocanoes.com](http://twocanoes.com)) helps transfer your Boot Camp partition, complete with all your apps and games, from one Mac to another. You'll need Winclone Standard (\$40), not the cheaper "Basic" edition, but it can be a real timesaver if you've got a lot of software to transfer. It's also cheaper than



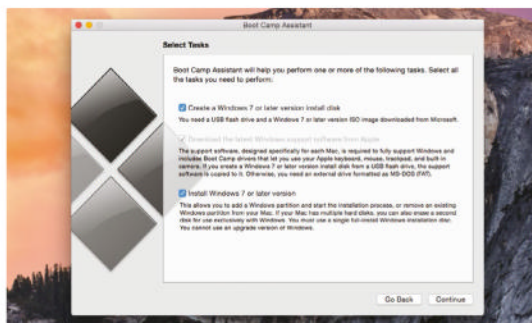
buying a new copy of Windows; if you originally bought a retail (boxed) copy of Windows then you can transfer the license to a new Mac. However, note that if it was an OEM copy (provided with a PC), it's legally tied to the hardware it came with.

**CLIFF JOSEPH**

## WINCLONE HELPS TRANSFER YOUR BOOT CAMP PARTITION FROM ONE MAC TO ANOTHER

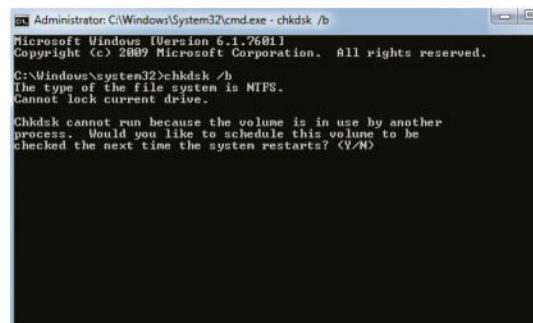
## UPDATING DRIVERS

Check that your new Mac works with your version of Windows – in other words, that Apple provides drivers for it. Unfortunately, some of the latest Mac models only work with Windows 8. See <http://apple.co/1JUZLO4> for compatibility.



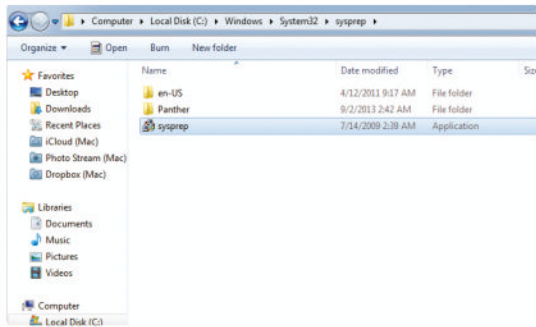
### 1 Boot Camp setup

Before transferring your old Mac's Boot Camp setup to a new Mac, open Boot Camp Assistant on the new one to create a partition for Windows and to download drivers to your empty USB flash drive. Once that's done, quit Boot Camp Assistant.



### 2 Opening Windows

On the old Mac, open Windows' Start menu or Start screen and type "cmd" to open a command prompt. Enter `chkdsk /b` to check your installation is healthy and can be copied with Winclone – if you're unfamiliar with `chkdsk`, read [bit.ly/mfwinclo.netut](http://bit.ly/mfwinclo.netut).



## JARGON BUSTER

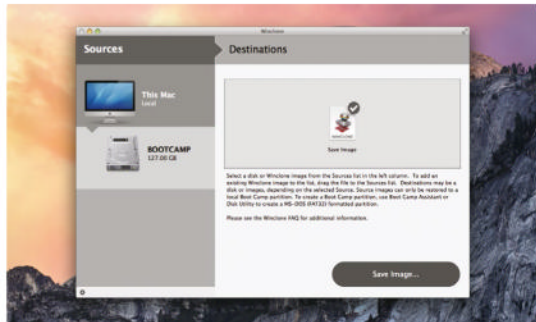
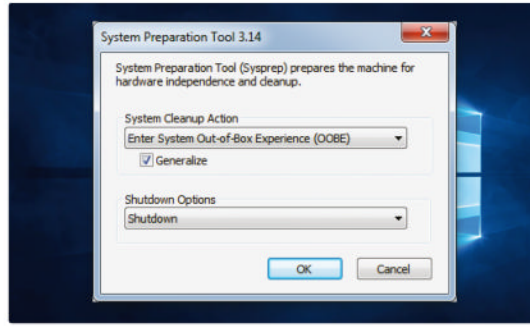
OEM (Original Equipment Manufacturer) copies of Windows are usually much cheaper than retail ones, but can only be activated once. It's then tied to that set of hardware, so you're not able to reinstall and reactivate it on a new system later on.

### 3 Windows drivers

Our Mac mini is quite old, so we need to remove the old Windows drivers - software that controls the processor, graphics card and other hardware. That's a big task, but you can do it quickly with Sysprep, which you'll find in C:\windows\system32\sysprep.

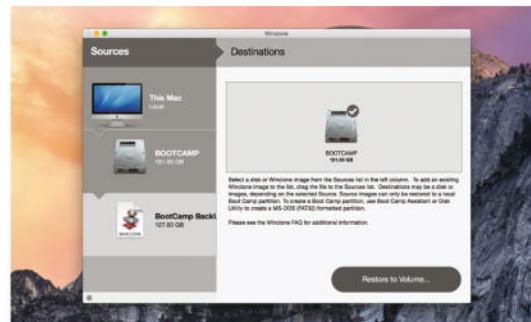
### 4 Out of the box

Select the "System Out-of-Box Experience" option and check Generalize. Select the Shutdown option and then click OK. This strips out the old drivers, leaving a clean version of Windows. When finished, Windows will shut down, and you can restart in OS X.



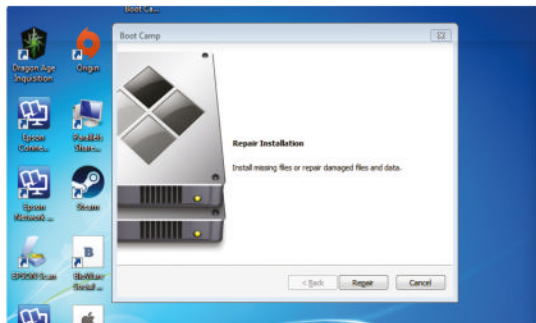
### 5 Boot Camp backup

Thankfully, things are more straightforward on the Mac side. Here, Winclone on our Mac mini has found our Boot Camp partition, so we just need to click Save Image to copy the Boot Camp partition to a file that we'll name "Boot Camp Backup." This will take a while.



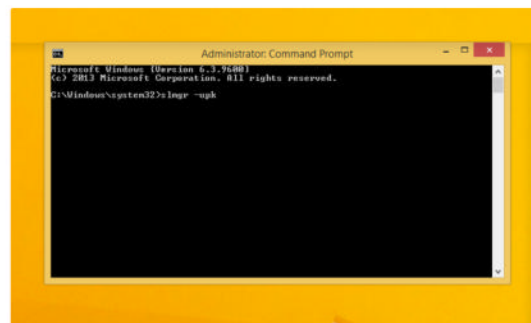
### 6 Restoring your image

Copy the image file onto an external drive, connect that to your new Mac and then open Winclone. Drag and drop the image file into the Sources panel and then click "Restore to Volume" to copy the image's contents onto the Boot Camp partition that we created.



### 7 Install the correct drivers

Now install the up-to-date drivers from your USB drive, which are needed for Windows to get the best out of the new Mac's hardware. The Windows setup works perfectly, and the whole-system migration even carries over the save files that contain game progress.



### 8 Windows activation

On your old Mac, from the Start menu or Start screen type "cmd" in the search field. Right-click the Command Prompt app which appears and run it as an administrator. Enter `slmgr -upk` to remove the product key. You can then activate Windows on your new Mac.

## QUICK BACKUP

Another handy feature of Winclone is the ability to back up your Windows user folder from Boot Camp to a folder on your Mac. You can configure it to back up hourly, daily or weekly, ensuring you always have access to your most important files in OS X.

# Master Evernote on iOS

Get the most from one of the most useful apps around

## REQUIRES

> iPhone, Apple Watch, Evernote

## LEVEL

> Easy

## IT WILL TAKE

> 30 minutes



**FOR MANY PEOPLE**, Evernote is indispensable. The ability to grab content from just about anywhere, sync it and share it with any device

linked to your account means you always have that crucial research information, recipe or checklist close to hand. Now that Evernote is on the Apple Watch too, the notes are even closer to hand – literally and metaphorically.

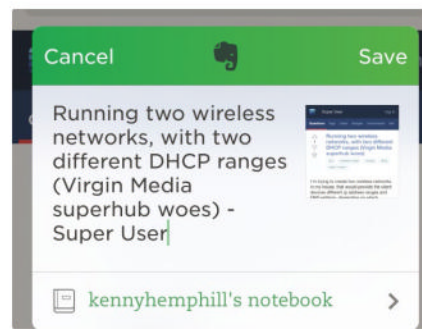
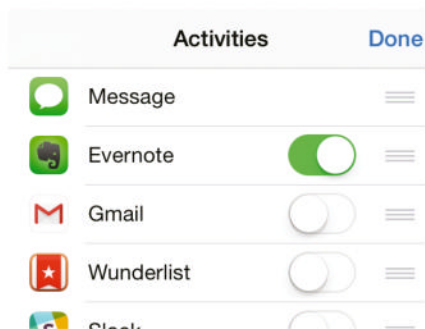
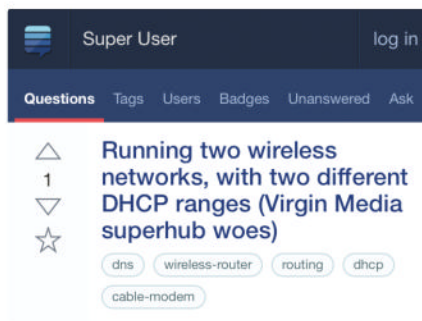
There's a lot more to Evernote, however, than just typing in new notes or grabbing clippings from the web. It's AppleScript-able, for example, so you can automate the creation of notes on your

Mac using tools such as Automator and Hazel. The iOS 8 version has a Today widget which allows you to create new notes without opening the app. Evernote has a chat facility so you can share ideas as well as notes, and reminders so you can set alerts for notes. If you allow it access to location settings, it can tag notes with your location – a useful aide memoir if you tap only the briefest of details into a note.

There are other features limited to the premium version of Evernote, but the free version is hugely powerful on its own. Here are our tips to get more from it. **KENNY HEMPHILL**

**THERE'S A LOT MORE TO EVERNOTE THAN JUST TYPING IN NEW NOTES OR GRABBING CLIPPINGS**

## How to Clip content from Safari



### 1 Find something to clip

Launch Safari and go to the web page you want to clip content from. We found instructions on configuring an AirPort Extreme router to act as a second router and wanted to save it. Tap the page to display the toolbar along the bottom of the screen and tap the Share button. If Evernote isn't displayed in the top row under AirDrop, tap the More button.

### 2 Add activity

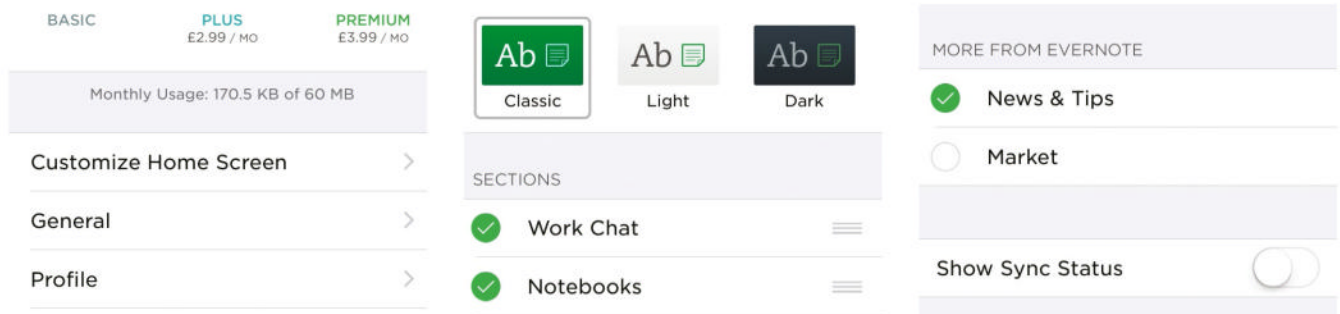
When you tap More, you'll see a list of apps. Find Evernote and turn its switch on. If you're likely to clip notes often, tap the three lines to the right of the switch, hold and drag it to the top of the list. Tap Done and the Evernote icon will be on the list of options. Tap it and you'll see a new note has been filled with content from the page you were viewing.

### 3 Clip it

The main body of the note is the title of the web page. At the bottom is the name of the notebook where it'll be stored. If you have more than one notebook in your account and want to add it to a different one, tap the name to choose it. Unlike the desktop web clipper, there are no options for how the note is clipped, though you can edit the title. When you're done, tap Save.



## How to Customize Evernote's home screen



### 1 Launch Evernote

When you launch Evernote, it displays snippets of information based on recent activity in the app. Along the top are quick access buttons for adding notes, but below are sections for Work Chat, recent notes, notebooks, and shortcuts. You can customize that, however. To get started, tap the cog icon next to the name of your account in the top-left corner.

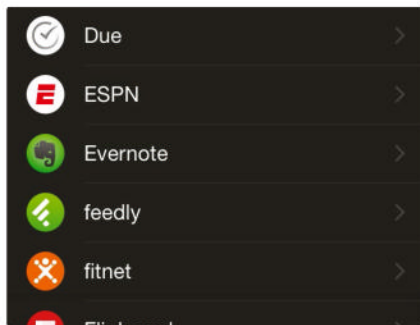
### 2 Change home screen

From the Settings page, tap Customize Home Screen. You can change the color theme from its default green to a light or a dark gray. Then go to the Sections area. The sections checked are those currently on the Home Screen. To remove one or more, tap the check mark next to it. To add one, tap the empty circle to the left of it. You can't remove Notes though.

### 3 Show sync status

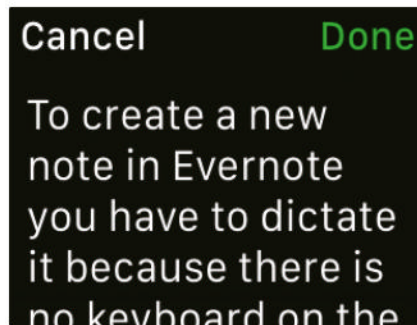
To change the order elements are displayed, tap and hold on the right of the one you want to move and drag it where you want it. In the Details section, switch elements on and off as required, depending on whether you want a summary of the notes in a section or not. At the bottom of the screen is an option to Show Sync Status. Switch it on if you think it's useful.

## How to Use Evernote on the Apple Watch



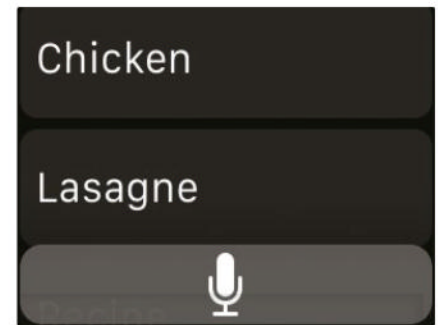
### 1 Add it to your watch

As with every Apple Watch app, you'll need to have Evernote installed on your iPhone and be logged in. Go to the Watch app on your iPhone, tap My Watch then scroll to Evernote and tap it. Set the slider to on. To receive notifications from Evernote for notes with alarms set, go to Notifications in My Watch, tap Evernote and slide that switch to on.



### 2 Add new notes

You can either open the app and press "+" or open the app, deep press on the screen, then tap the New Note button. To create the note, you have to use dictation, so once you've tapped +, speak to the note and press Done when finished. Evernote will display the text on screen. Tap Done if happy and Evernote will display the Note. Tap Save.



### 3 Search for notes

As with the last step, you can either press the magnifying glass on the home screen, or deep press then select it. Scroll through the keywords and if your search term is there, tap it. If it's not, you'll have to tap the microphone and dictate the search term. It's hit and miss; we often found that even though Evernote recognized what we said, it was unable to find relevant notes.

# Archive iOS photos to Flickr

Use the website's free 1TB of storage to back up and share your snaps

## REQUIRES

> A Flickr account, Flickr app for iPad or iPhone, iPad or iPhone, Wi-Fi connection

## LEVEL

> Easy

## IT WILL TAKE

> 30 minutes

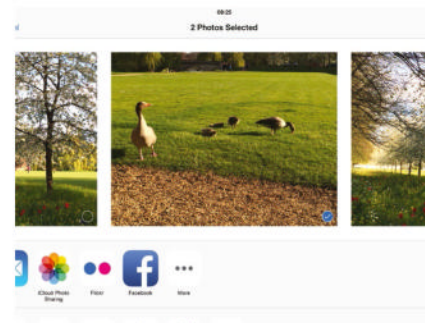
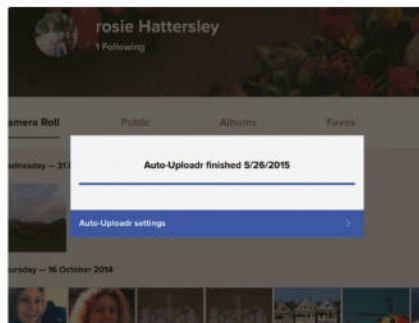
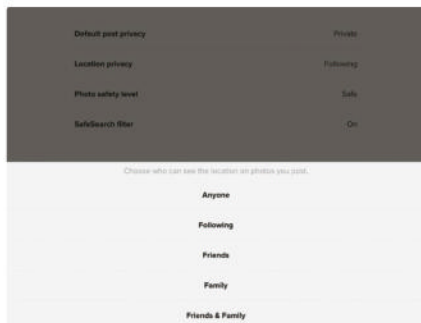


**IF YOU ROUTINELY** sync your iPad and iPhone with your Mac and use iCloud storage, you might not be too concerned about losing your Apple device. Well okay, yes, you'd be upset about losing your precious tablet extraordinaire, but you'd know your photos were safe. It can cost a lot to store photos this way, though – plus, it's no fun sorting through thousands of pics when you don't have the time to find a particular one.

Flickr, the image- and video-hosting site, is free and offers a whopping 1TB of storage. You can view slideshows online as well as on your iPad or iPhone, and you have full control over whether photos are private, shared with friends and family or, of course, with the wider world. The app's Auto-Uploadr function syncs your iPad and iPhone photos to your Flickr account, or you can upload individual photos from your Camera Roll. **ROSIE HATTERSLEY**



## How to Store your photo archive on Flickr



### 1 Set up sharing

Go to Flickr.com and choose a username and password. Next, install the Flickr app from the App Store and add your account details when prompted. Add a profile photo then go to Settings > Privacy and safety to set your privacy preferences. Turn on Photo Stream if you want photos from your iPhone to appear on your iPad and in your Flickr account.

### 2 Auto uploading to sync photos

Open the Flickr app on your iPad and you should see a message that all your photos have been synced using Auto-Uploadr. Auto-Uploadr can only work on a Wi-Fi connection. Your Camera Roll shows the most recent thumbnails and you can mark them as Faves or Public – the latter allows other Flickr users to see them.

### 3 Adding more photos

A hefty iPad photo collection can take an hour or more to upload to Flickr. If you're sharing photos using Photo Stream, images deleted from your iPad won't show up on your iPhone unless they were taken with it. If you don't want to add your whole collection, open the Photos app on your iPad, tap Share then tap the Flickr icon to upload an image.

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RANDOM APPLE MEMORY

# OS X 10.0

Adam Banks recalls how OS X was the key turning point for Apple's fortunes



OS X's "Aqua" design was gorgeous. No, really! Look, it was 2000, things were different then.

**ONE OF APPLE'S** lowest moments came in 1996, when CEO Gil Amelio realized the Mac's long-anticipated new OS simply wasn't going to happen. Amelio's focus had been on cutting costs, but Apple's workforce had fragmented under previous CEO Michael Spindler, with every team desperate to justify its existence, but no one getting anything done. Amelio brought in a troubleshooter: Ellen Hancock. Apple's problem wasn't hard to find: the Mac OS project, codenamed Copland, had become a bandwagon hitched to every hobby horse

on campus, and it was going nowhere. Hancock's solution was to throw it all out and buy in an OS. She favored Sun's Solaris, but the talk of Silicon Valley was BeOS, brainchild of former Apple executive Jean-Louis Gassée. It was fast, and an emphasis on marketing made it look like the future.

Amelio, however, balked at betting the company on the relatively untested BeOS. Instead, he paid \$429m for rival computer maker NeXT and welcomed its chairman, Steve Jobs, back to Apple. It was still three years before Jobs could walk on stage in

San Francisco at MacWorld 2000 to show the result of adapting the NeXTSTEP OS to the Mac. By that time, he'd ousted Amelio. OS X promised "state of the art plumbing" fronting "killer graphics." Its look and feel, known as Aqua, was even more radical. User interfaces had always been shades of gray. This one, as writer David Pogue put it, was lickable.

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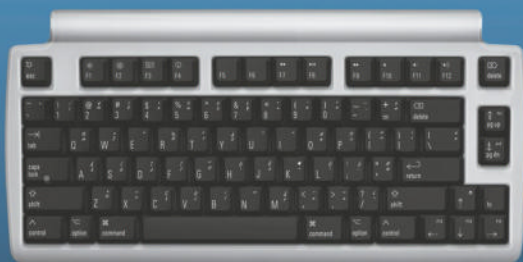
Mac users who crave the **satisfying “click”** of Apple’s legendary **Apple Extended Keyboard** will LOVE the **Tactile Pro**. Unlike other keyboards made these days, each key is built on a premium ALPS mechanical switch. They feel better and you’ll type faster.



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